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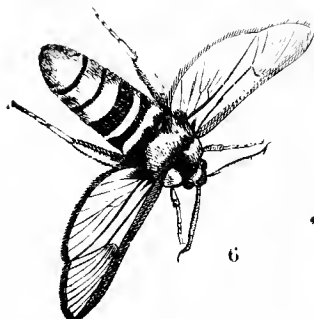
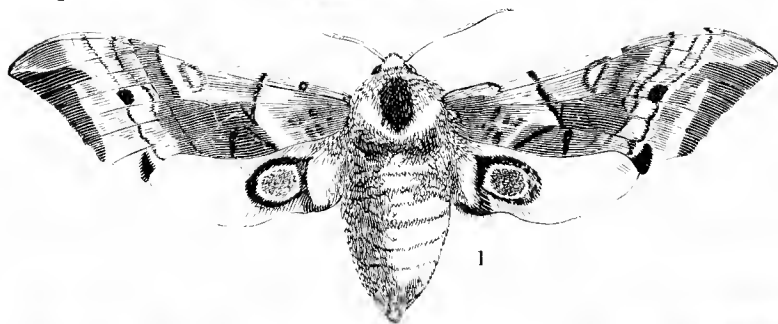
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## PREFACE.

THIS little work is intended merely as an introduction to that department of Entomology of which it treats.

The Moths of England are so numerous, that the mere mention of the names and synonyms of all the species would fill the entire book. It is necessary, therefore, to make a selection of them, and this has been done so that the young Entomologist will find in the following pages a figure and description of nearly every Moth that he is likely to find. As a rule, the commonest and most conspicuous species have been selected; and although one or two of the rarer Moths are mentioned, it is because they are too important to be omitted.

Throughout the whole of the book I have endeavoured to keep in mind the sort of instruction which I needed when beginning the study of Entomology without any guide whatever, and I trust that this little work will supply to my successors the help which I so greatly needed in times now past.

## ADDENDUM.

THE following description was accidentally omitted, and should have been inserted immediately after the account of the Clouded Magpie Moth on page 61 :—

ON Plate VI. fig. 3, is seen the delicate little CLOUDED BORDER MOTH (*Lomaspilis marginata*), represented of the natural size.

The upper wings of this very common Moth are white, and are edged with grey-black borders as shown in the figure. Beside the dark border, there are other dark lines and marks upon the wings; but as scarcely two specimens are exactly alike, no detailed description can be given.

The larva of this insect feeds on the willow, and is olive-green, marked with longitudinal white or yellow stripes. The Moth is seen throughout the end of spring, up to the beginning of autumn.

# THE COMMON MOTHS OF ENGLAND.

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## CHAPTER I.

### NOCTURNI.

As I desire to give an intelligible and popular account of the Moths which are most generally to be found in this country, I shall describe them as simply as possible, giving a short account of their appearance and habits, and shall render the whole of the scientific portion of the work as little obtrusive as possible.

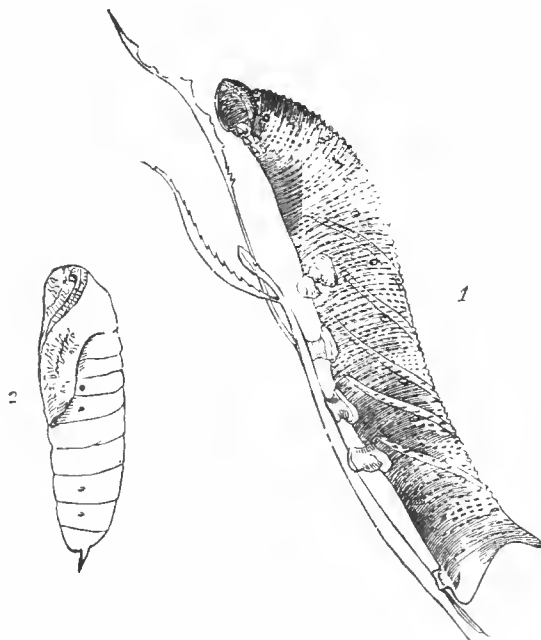
Some account of this dry scientific technicality is absolutely necessary, but it has been considerably simplified, and, when aided by the accompanying illustrations, the reader will find no great difficulty in it. Moreover, he will possess that which I earnestly desired when I first began the study of insects, namely, an easy introduction to works of a more strictly scientific character.

It will be as well to preface that the order of insects called Lepidoptera, to which the Moths belong, is distinguished by the feathery scales which cover their wings. They pass through three distinct changes of form after they quit

the egg : firstly, the larva or caterpillar ; secondly, the pupa, or chrysalis, or aurelia, as it is called ; and lastly the imago, or perfect insect. All these characteristics are common both to the Moths and Butterflies, but the young naturalist will have no difficulty in distinguishing between these great divisions of the Lepidoptera, if he will remember that the Butterflies have their antennæ or horns ending in a little knob, whereas the antennæ of the Moths are pointed.

WITHOUT further preface we will take the first insect on our list, the EYED HAWK MOTH (Plate I. fig. 1), which is selected as the representative of its genus. The Hawk Moths owe their popular name to the swiftness of their flight, in which they bear much the same place among Lepidoptera as the hawk among birds. The average span of wings of this Moth is about three inches. The thorax and abdomen in this as in other sphinges are covered with a thick hairy "pile" of a close velvety texture. The fore-wings are of a ruddy brown, with marking of a lighter shade, clouded with olive. The hind-wings are of a beautiful rose tint, fading gradually towards the margin into ruddy brown, and thence into grey ; near the hinder angle of each is a dark patch with an eye-like marking of a pale bluish tinge, hence the name "eyed hawk." A horse-shoe-shaped marking on the back of the thorax, of the same colour as the "eyes" above mentioned, will also prove serviceable in identifying this striking insect. The abdomen is of much the same shade of colour as the fore-wings, and is marked with transverse bars of a deeper hue

The larva or caterpillar is green, with seven pink stripes drawn diagonally on each side, and a pointed horn on the tail. This latter characteristic is common to all the true Hawk Moths. It may be obtained from willows, and the pupa



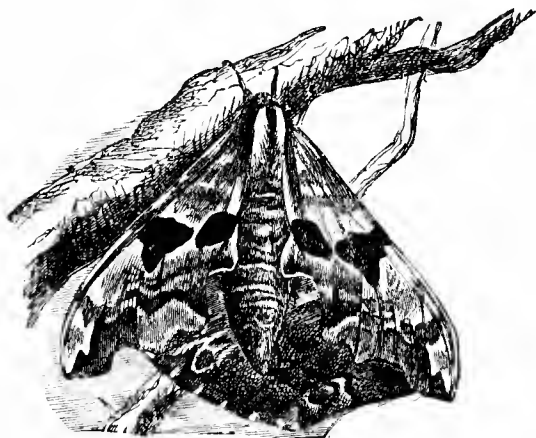
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or chrysalis can be found by digging at the roots of the tree. September is the best month for this purpose. The caterpillar is shown in fig. 1, in the above illustration.

In connection with this Moth must be men-

tioned two other species of the same genus ; viz. the POPLAR HAWK MOTH (*Smerinthus populi*) and the LIME HAWK MOTH (*Smerinthus tilix*).

The former of these two insects resembles in shape the Eyed Hawk Moth, but is almost entirely brown, and without the "eyes" which distinguish that insect. The caterpillar feeds on the poplar, and is without the pink hue of the lateral stripes. The latter is buff in colour, and marked with bright olive green. The caterpillar is smaller than that of the preceding insect, and



Lime Moth.

is very rough on the surface. The lateral stripes are pale pink. It feeds on the lime, and changes into the chrysalis state about September.

In some parts of the country it appears to be rare, but I have found it plentiful enough in those places where I have resided.

In order to show the curious position which this Moth is fond of assuming, I have selected a figure drawn from a living specimen. In this attitude it so closely resembles a partly-withered leaf, that when it is clinging to a branch even the most practised eye can scarcely detect it.

WE next come to that splendid insect popularly known as the DEATH'S-HEAD MOTH (*Acherontia atropos*, Plate I. fig. 2), on account of the peculiar mark on the upper part of the thorax. The span of wings of this, the largest of our British Lepidoptera, averages about four and a half inches.

The peculiar velvety clothing of the thorax and abdomen, mentioned above as so remarkable in the sphinges, is especially noticeable in this species. The colour of the upper wings is a dark blackish brown, shaded and mottled with ochreous yellow, warming into chestnut. The lower wings are buff, marked with two blackish bars. The abdomen is of the same colour as the lower wings, but diversified with six transverse bars, of a deep bluish black, crossed by another that runs lengthwise along the upper surface throughout its whole length.

On the thorax is the singular "death's-head" from which the insect derives its name: a representation, in some specimens of marvellous fidelity, of a skull plainly figured in yellowish buff on a black ground. This remarkable insect has the power, supposed to be unique among the Lepidoptera, of emitting a shrill creaking sound, somewhat resembling the squeak of a slate-pencil.

In some parts of the country the Death's-



head Moth is scarce, while in others it is comparatively plentiful. In Kent it is found in profusion, and I have often had several alive at the same time, they having been caught by the field-labourers and brought to me. Each time that the Moth utters its strange, squeaking note, the whole body gives a convulsive sort of start. It can always be induced to squeak by being irritated.

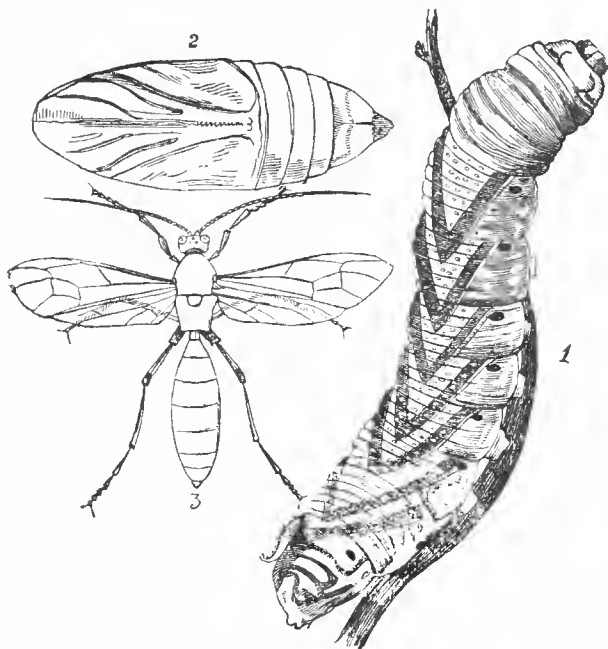
The reader must especially notice the short stout proboscis and the oddly-hooked antennæ. As is the case with many of the larger Moths, its eyes shine in the dark like two balls of fire, the effect of which is very remarkable when the insect is confined in a room dimly lighted by a single candle.

The larva of this Moth is, when full-grown, a very giant among caterpillars. Its colour is green, with diagonal pink stripes; and the horn on the tail, instead of being hard, smooth, and sharply pointed, as is the case with the horns of the Hawk Moths already described, is yellow, comparatively soft, and covered with little projections.

Fig. 1 in the following illustration will enable the reader to detect the caterpillar if he sees it, but is necessarily reduced to less than half the size of a full-grown larva.

It feeds on the jessamine and potato; and in places where the latter vegetable is much cultivated, the caterpillar is mostly common. Like other caterpillars, it can be reared in captivity, but the task is a very troublesome one, partly on account of the quantity of food consumed by so large and voracious a creature, and partly because it is rather a delicate larva, and apt to

die without any apparent cause. Should the pupa, of which a figure is also given, be found, it must be placed on earth kept slightly damp by a handful or two of wetted moss laid over it. Otherwise the pupal envelope becomes so hard and horny, that the enclosed moth is un-



E

able to break its way out, and perishes. When I first began moth-breeding, I lost several specimens by allowing them to become too dry.

Yet, in any case, breeding moths from the

caterpillar, or finding the pupæ and keeping them until the insects come out, is a plan far superior to that of catching them, inasmuch as a captured moth is seldom killed without having suffered some damage. Those that are bred, on the contrary, can be watched until their wings have attained their full development, and can then be quietly slipped into a box, and killed either with the vapour of chloroform, or that of bruised laurel shoots. For my own part, I prefer the latter, as the chloroform is apt to make the wings so rigid that there is much difficulty in "setting" the insect properly.

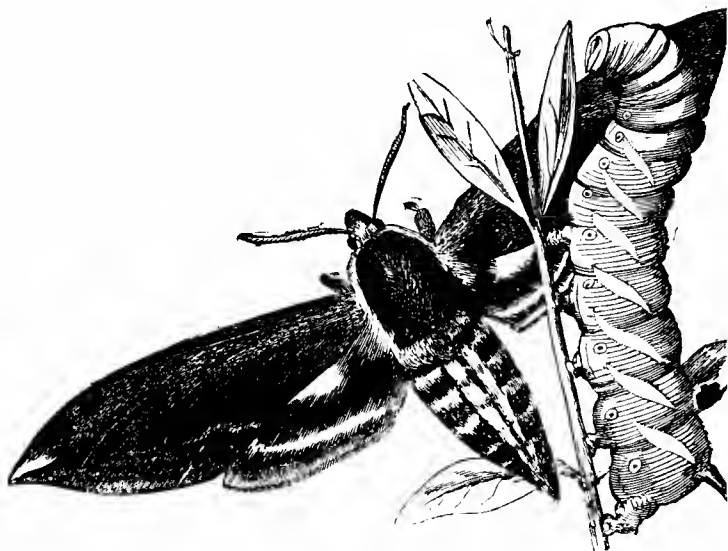
Many pupæ, especially of the larger moths, are also lost through the means of some ichneumon fly, which has laid its eggs within them.

It is impossible to detect a "stung" caterpillar until it has ceased feeding, and not always easy to detect it even at that time. Often the caterpillar changes into a chrysalis without betraying any signs of the mortal injury that it has sustained; but, when the time arrives for the appearance of the insect, the disappointed collector finds that instead of the moth the ichneumon fly occupies the box.

In such a case the ichneumon should always be killed and preserved, together with the chrysalis from which it emerged, so that in process of time a valuable collection is formed of moths and the various species of ichneumon which infest them.

In the illustration on page 7, the reader will see a figure of the ichneumon fly which attacks the Death's-head Moth, fig. 3, the pupa being shown in fig. 2.

WE will briefly take notice of one or two insects which ought not to be entirely passed over. One is the PRIVET HAWK MOTH (*Sphinx ligustri*), so called because the caterpillar feeds upon the leaves of the privet.



Privet Moth and Larva.

It is a very handsome insect, measuring more than four inches across the wings, which are very stiff and sharply pointed. The upper wings are mottled with various shades of brown, and the lower are pink, changing into yellow, and banded with three curved bars of deep black-brown. The abdomen is rose-pink, barred with black. The caterpillar is a large green larva.

with pink lateral stripes, and the upper part brown-black, and the lower yellow.

Another species, the CONVOLVULUS HAWK MOTH (*Sphinx convolvuli*), is sometimes, but rarely, found in England. Though larger than the Privet Moth, it is not nearly so handsome, the colour of the wings being almost entirely grey and brown. The caterpillar feeds on the common bindweed.

At fig. 2, on the cut D (page 3), is seen a rather remarkable chrysalis. This is the pupa of the SPOTTED HAWK MOTH (*Deilephila euphorbiæ*). This Moth is a very pretty one, rather more than three inches in expanse of wing. The upper pair of wings are yellowish brown, mottled with black, and the lower of the same hues, but varied with pink. The abdomen is greyish white, with two black transverse bands, and the extremity is brown.

The larva feeds on the sea-spurge (*Euphorbia paralia*).

ON Plate I. fig. 3, is shown the SMALL ELEPHANT HAWK MOTH (*Chærocampa porcellus*), as an example of the Elephant Hawk Moths, so called from the length to which the proboscis extends. It can be distinguished from the Sphinx Hawk Moth by its shorter and more rounded wings. The wings, which are uniform throughout, are of a pale buff, tending to orange, with three distinct transverse markings or bands of ruddy brown: one along the outer margin, extending through both upper and lower wings, one parallel with it through the middle, and the third at the base or insertion of the

wing. The thorax is coloured like the wings. The abdomen is of a pale olive brown, with transverse bands of a lighter shade.

The name *chærocampa* signifies "hog-caterpillar," and is given to this genus because the head and first two segments of the body narrow suddenly like the head and snout of a hog.

The larva feeds on various species of *salium*, or bed-straw.



Elephant Hawk Moth.

The ELEPHANT HAWK MOTH (*Chærocampa Elpenor*) [see above] is rather more plentiful than the preceding insect, and may be found by the side of ditches, the caterpillar feeding on the common willow herb. This larva is remarkable for two great black spots, one on either side of the body, looking much like eyes.

Our next insect is the HUMMING-BIRD HAWK MOTH (*Macroglossa stellatarum*), Plate I. fig. 4.

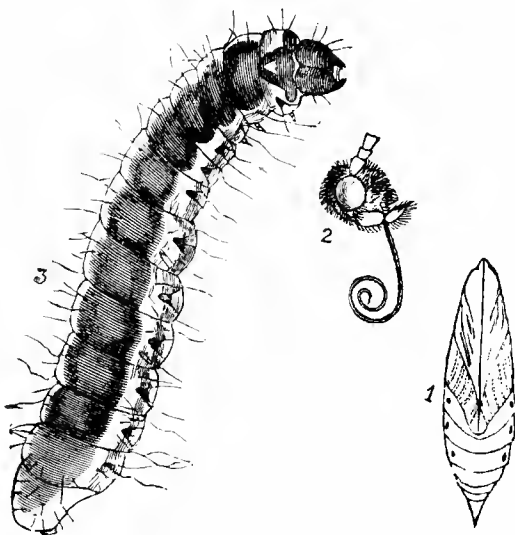
This Moth, which is tolerably common, has been very familiar to the public of late years, on account of the many letters which have appeared in the daily journals, much to the amusement of practical entomologists, who have been too familiar with the insect in question to think it worth a special notice.

It derives its name from the style of its flight, which so closely resembles that of the humming-bird that persons who have resided in the West Indies, and afterwards come to live in England, have been deluded into the idea that they have seen genuine humming-birds flying about.

The average span of the wings is rather less than two inches. The upper pair of wings are of a neutral tint, tending to brownish black. Across the centre of each run two parallel wavy black lines, about one-fourth of an inch apart, in the space between which is a small black dot. The rest of the wings are of a cloudy pattern, pale in the middle and tending to black at the base and outer margin. The lower wings are pale yellow, shaded with blackish grey at the base, deepening into orange towards the margin, and thence to a ruddy brown.

The thorax, which is well clothed with hair, is uniform in colour with the fore-wings—a brownish black; a wedge-shaped streak of the same colour runs along the upper part of the abdomen to the tail, which is strongly tufted with hairs of a similar shade. The rest of the abdomen is marked in chequers of black and white. The long spiral tongue and proboscis can be projected to a considerable distance from the head, so that the insect can feed while on the wing.

Few persons, when they have once seen it, will forget the manner in which this Moth feeds. The spectator may be looking at a flower, and be close to it, when suddenly a moth appears in front of the blossom. How it got there he does not know, for it appears as if it had been gifted with the power of making itself visible and invisible at will.



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Presently, a long, thread-like proboscis is thrust into the flower, and there the insect feeds quite at its ease, suspended in the air by the wings, which are scarcely visible from the rapidity of their motion. It is very bold, and



as long as the spectator is quiet or moves gently it will continue to feed ; but if even a hand be moved sharply, it shoots off as rapidly as it came, and its place is vacant as if by magic.

The Humming-bird Moth is fond of flying along the sunny side of walls, and, swift as is its flight, may be taken in a common butterfly-net by meeting it in its course along the wall, and giving a sharp, quick stroke of the net as the insect draws near. The larva feeds on many plants of the stellate kind, and hence derives its specific title of *stellatarum*. The pupa or chrysalis of this insect is shown in the preceding illustration (fig. 1).

There are only two other English insects belonging to this genus. The first is the NARROW-BORDERED BEE HAWK MOTH (*Macroglossa bombyli-formis*); see Plate I. fig. 5. According to several systematic zoologists, this Moth belongs to the genus which immediately follows ; but in Mr. Doubleday's arrangement it takes the position which is here assigned to it.

The average span of the wings is a little more than one inch and a half. They are almost entirely transparent, showing the nervures as a dark tracery. The margins only, which are of a greyish brown, have any distinct colour. The thorax and abdomen are hairy, the former being of a dull ruddy brown, and the latter strangely coloured in two distinct segments—the upper half a lively crimson, and the lower or tail half a bright yellow.

The whole insect bears a strong superficial resemblance to the humble-bee tribe, whence its name ; it has however, of course, no real affinity with the bees.

The larva of this insect feeds on the Devil's-bit scabious (*Scabiosa succisa*).

The second species, the BROAD-BORDERED HAWK MOTH (*Macroglossa fuciformis*), much resembles the preceding insect, from which it can be distinguished by the greater breadth of the dark border round the wings.

NEXT come a few more of the remarkable Clear-winged Moths, the first of which is the HORNET MOTH (*Sesia apiformis*). The popular name is a very appropriate one, as the insect bears the most extraordinary resemblance to a wasp or hornet, and scarcely any one, except an entomologist, would like to touch it with the bare hand.

The average span of the wings is rather under an inch and a half. They are almost entirely divested of plumage, except on the borders, which are edged with a narrow band of brown. The thorax is also brown, mottled with a darker hue, and the abdomen is yellow, banded with dark red. So close is the resemblance between this insect and the wasps, that when showing my collection, I have often found great difficulty in persuading the spectators that the insect was really a moth, and have been obliged to place a veritable hornet by the side of the Hornet Moth before they could see the distinction between the two insects.

The larva of the Hornet Moth is one of the wood-borers, and lives in the interior of poplar-trees. It can generally be found in the trunk at a little distance from the ground. When the insect is about to pass into the perfect state, the

chrysalis works its way through the gallery which it had bored when a caterpillar, and partly projects, so that when the Moth makes its appearance it passes at once into the air. Sometimes the chrysalis emerges altogether, and can be found among the loose bark near the roots.

A figure of this Moth is given in Plate I. fig. 6.

On the same plate, fig. 7, is another insect of the same genus. This is the CURRANT CLEAR WING MOTH (*Sesia tipuliformis*), which bears the same curious resemblance to a gnat that the preceding insect does to a hornet.

The average span of wings is rather under an inch. Both wings, like those of the preceding insect, are transparent. They are tinged with yellow towards the margin, which is black. The thorax is of a deep blue black, with a slight yellowish streak on either side. The abdomen and its anal tuft are of the same colour, with three yellow bands.

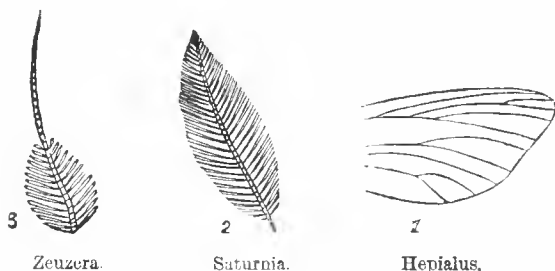
The larva of this pretty little Moth lives in the interior of currant twigs, where it feeds upon the pith. It may often be seen in the summer reposing on the leaves of the currant-bushes, enjoying the rays of the sun, and may easily be captured.

WE now come to another family of Moths, the best representative of which is that singularly pretty insect, the WOOD LEOPARD MOTH (*Zeuzera æsculi*).

The span of wings depends much on the sex of the insect, that of the male being about two

inches, and that of the female half an inch wider. As is often the case with insects and birds, the female is by far the larger and handsomer insect.

The fore-wings are semi-transparent, of a faint greenish yellow, thickly studded with blue-black spots of a rich metallic lustre. The hind-wings are similarly though more faintly marked. The thorax is also similarly coloured, with seven blue-black spots, arranged somewhat like the seven in a pack of cards. The abdomen is hairy, and



G

of the same greenish tinge, deepening into an almost olive shade at either side.

The antennæ are very beautifully formed, and deserve examination through a magnifier. An enlarged representation of this organ is given in the above illustration (fig. 3). This pectinated form of the antennæ furnishes a simple characteristic by which to distinguish the sexes, the antennæ of the former being without the feather-like appendages at the base.

The larva of the Leopard Moth, like that of the preceding insect, is a wood-borer, and often

c

does considerable damage to the pears, apples, chesnuts, and walnuts, not to mention the elm, ash, and other forest trees, the oak being apparently too hard for its jaws.

When it is about to make its way out of the branches in which it has been feeding, it changes the course of its burrow, cats away the wood close to the surface of the bark, and then spins a cocoon made of wood-chips, in which it remains until the time for its entrance into the world.

The insect is shown in Plate II. fig. 1, and the form of its burrow is seen in the illustration marked L, fig. 3, p. 19.

THE largest and most destructive of the wood-boring Moths is shown in Plate II. fig. 2. It is popularly called the GOAT MOTH (*Cossus ligniperda*), because the larva exudes a powerful odour which has been compared to that of the he-goat. The odour in question is not only powerful, but enduring. It is possible to detect the hidden habitations of the Goat Moth and caterpillar by the scent that issues from the burrows, and some of the cocoons spun by the larva still retain their peculiar odour, though five or six years have elapsed since I took them from the tree.

The span of wings is rather more than three inches. The fore-wings are greyish brown, clouded with white, and marked with numerous transverse bands. The hind-wings are the same, but more faintly coloured. The thorax is brown, tinged with yellow; the abdomen, which is large, the same, with a longitudinal

yellow band along its full extent. The other plumage is remarkably soft and woolly.

The larva is, when full-grown, very large, smooth, and of a mahogany-red colour. It remains in the larval state for three years, con-



L

structing in the winter of each year a cocoon from the chips of gnawed wood. These cocoons vary in size with the dimensions of the insect, and I have before me a series of three cocoons

made by the same larva, that I was fortunate enough to procure from a willow-tree in Kent.

The willow is the favourite tree of the Goat Moth, though the insect does attack the poplar, the ash, and the elm. A figure of a half-grown Goat Moth larva is given in the illustration marked F, fig. 3, page 13.

The Goat Moth is the only English representative of the genus. By some naturalists the caterpillar is thought to be the "cossus" which, when cooked, was a favourite dish with Roman epicures in the time of the Cæsars.

OUR next insect is the curious GHOST MOTH (*Hepialus humuli*), which is shown in Plate II. fig. 3.

The span of the wing is rather under two inches and a half. The wings of the male are snowy white above, presenting an almost glazed appearance, and fringed with yellow, under-side a yellowish brown. The thorax and abdomen are yellow shaded with orange. The wings of the female have none of the sheeny gloss which distinguishes those of the male, but are dull yellow, shaded with orange, with several irregular annular markings.

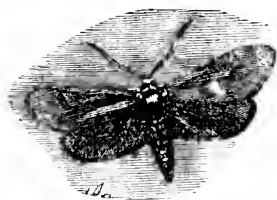
The rather ominous name of Ghost Moth is given to the insect in consequence of the habits of the male.

It is given to fluttering over the herbage at eighteen inches or two feet from the ground, and occasionally settling on a stalk of grass, or similar object. As it is flying about in the dark, the white shining upper surfaces of the wings glitter in a most curious manner, almost appearing as

if giving out their own light. But as soon as the insect settles on a stalk of grass or other herb, the dark under-surface is turned upwards, and the insect disappears as if by magic.

The eggs of this moth are small, black, and not unlike gunpowder, and the larva feeds mostly on the roots of the hop, as is implied by the specific name. The peculiar nervures of the wing are seen in cut G, fig. 1, page 17.

A tolerably common example of the family of the Procridæ is found in the GREEN FORESTER (*Procris Statice*).



Green Forester.

Its shape may be seen from the accompanying illustration, which is of the natural size. The upper wings are green, with a peculiar translucent gloss, and the lower

wings are brown. The short, stout, dark green caterpillar feeds on the sorrel.

The only other British member of this family, the SCARCE FORESTER (*Procris Globulariæ*), resembles the Green Forester in shape, but may be distinguished by the coppery gloss of the upper wings.

NEXT in order comes the pretty and common SIX-SPOT BURNET MOTH (*Anthrocera filipendulæ*), which though by no means the largest is certainly one of the handsomest of the British Moths. The body and fore-wings are a deep metallic indigo green, each wing having six crimson metallic



spots or markings; hind-wings rich crimson, with narrow dark green bordering.

The green of the upper wings is so exceedingly deep as to look almost black at the first glance.

The larva of the Six-spot Burnet Moth feeds chiefly on the common deepwort (*Spiræa filipendula*), and towards the end of May the chrysalis may be found in profusion, inhabiting a spindle-shaped cocoon fixed throughout its length to a stalk of grass or similar support. I have seen a field so covered with these cocoons that it was scarcely possible to walk without crushing them. One of these cocoons is shown in cut L. fig. 1, page 19, as it appears when attached to the grass and the head and tongue of the insect are shown on cut F, fig. 2, page 13.

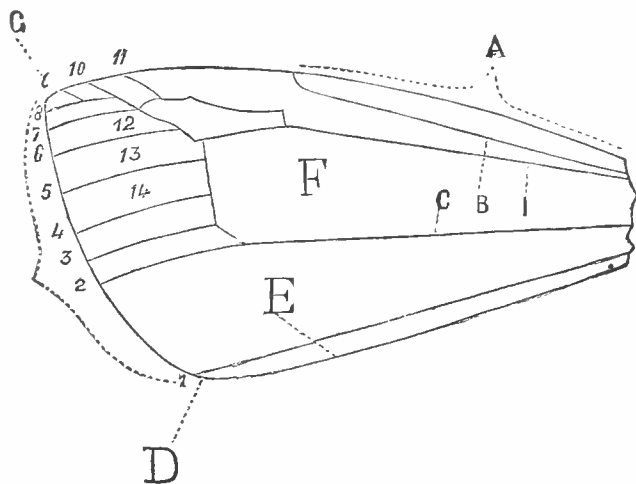
An insect allied to the preceding species is the large CHIMNEY SWEEP (*Sterrhopterix* [Psyche] *nigricans*).

The wings of this interesting insect are soft pink brown, and that slightly covered with plumage. Only the male has fully developed wings, those of the female being so diminutive that she is practically wingless, looking much more like a grub than a moth. The larva makes for itself a curious dwelling of little twigs and similar materials, and never leaves its home as long as it remains in that stage of existence. A figure of the larva in its moveable home may be seen in cut L, fig. 4, page 19.

Mr. Doubleday thinks that this family ought to be placed among the Tineæ.

WE now come to some of the Moths which are called by the fanciful name of Footman.

The first of them is the LARGE FOOTMAN (*Lithosia quadra*), which is represented in Plate II. fig. 5, a little less than the average size. The fore-wings of the male are grey, deepening in shade towards the anterior margin, and the hind-wings are pale yellowish white. In the female, the fore-wings are primrose yellow, and have two distinct black spots towards the middle.



A

In the above description the words "anterior margin" are mentioned. Although I intend to avoid the use of strictly scientific terms as far as possible, there must occur instances where it is impossible to do so. I therefore insert two diagrams representing the various portions of the

upper and under pair of wings, showing the divisions as they are, like the countries in a map. These divisions are not arbitrary, nor the mere invention of entomologists. They are the natural boundaries of the wings; and, unless the reader makes himself acquainted with them, he will find himself quite at a loss when reading the descriptions of insects in purely scientific books.

The preceding diagram represents the various parts of the upper and anterior wing of the Moth.

Beginning with the part designated by the capital letters, *A* is the anterior margin, *B* the costal nervure, *C* the median nervure, *D* the anal or posterior angle, *E* the posterior or interior margin, *F* the discoidal cell, *G* the anterior angle, *H* the outer or exterior angle, *I* the subcostal nervure.

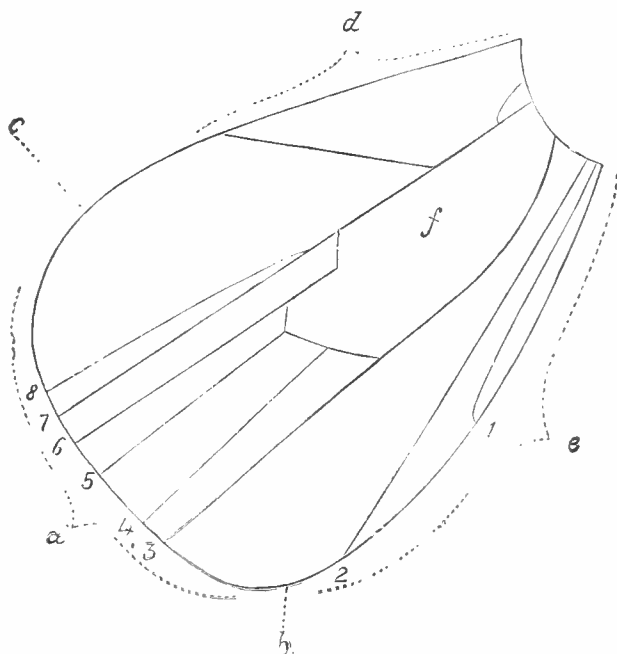
Next we come to those divisions which are designated by figures.

1 is the sub-median nervure; 2, the first median nervure; 3, second ditto; 4, third ditto; 5 and 6 are the discoidal nervures; 7, 8, 9, 10, 11, the subcostal nervures; 12, the disco-cellular nervule; 13, the middle ditto; and 14, the lower ditto.

The following diagram represents the corresponding divisions of the lower or posterior wings.

In the diagram, *a* is the outer or posterior margin, *b* the anal or posterior angle, *c* the anterior angle, *d* the anterior margin, *e* the abdominal margin, and *f* the discoidal cell. Taking the parts represented by figures, 1 is the sub-median nervure; 2, 3, 4, the median nervules; 5, the discoidal nervure; and 3, 7, 8, the subcostal nervules.

These seem rather crabbed terms, and difficult to learn, but they are soon mastered, and a knowledge of them is absolutely necessary to the entomologist. The best way of learning them is to take three or four different Moths, and by the aid



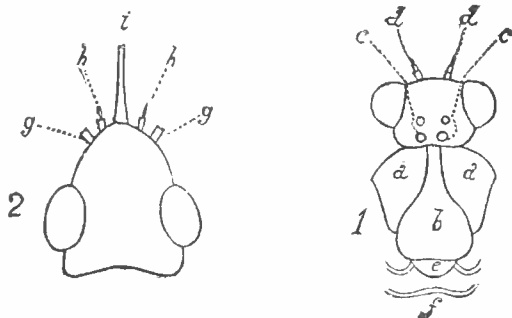
B

of the diagram A (page 23) to trace the different parts. At first this will seem rather difficult, as the nervures are not nearly so distinct in the Moth as in the diagram. A very little practice, however,

will enable the eye to trace them without the least difficulty, and when they are once learned they will not be forgotten.

The important part of the head and thorax of a Moth are shown in the diagram below.

We will take fig. 1 first, and begin at the top. *d d* are the palpi; and between the large, protuberant compound eyes which project from the sides of the head, are the little simple eyes called calli. These are shown at *c c*.



C

The thorax is divided into three portions. The first is called the prothorax, and the two lobes of its collar are seen at *a a*; the middle part or mesothorax is shown at *b*; the last portion or metathorax is shown at *e*, and the scutellum at *f*.

Fig. 2 gives the parts of the head on an enlarged scale. In the middle, at *i*, is the tongue, or proboscis. At either side of the tongue are the palpi, *h h*, and at *g g* are the cavities into which are inserted the bases of the antennæ.

There are, of course, many other divisions of body, but these are the most important.

WE will now return to the description of the Moths which have been selected for this book.

On Plate II. fig. 6, may be seen the SPECKLED FOOTMAN (*Eulepia cribrum*). This is not so common an insect as many of our examples, but it is too characteristic to be omitted from the book. It may be found in Hampshire, the caterpillar feeding on the heath. It derives its popular name from the mode in which the white upper wings are speckled with black and brown spots, arranged in a tolerably regular order.

Another of these Moths, the CRIMSON SPECKLED FOOTMAN (*Deiopeia pulchella*), is shown in Plate II. fig. 7. It is a singularly pretty insect, and is found towards the end of autumn. Like the preceding insect, it is scarce, but too conspicuous to be omitted. The caterpillar is said by Mr. H. N. Humphreys to feed on the common forget-me-not. I am not personally acquainted with this larva. Fore-wings white, studded with crimson spots closely interspersed with smaller black ones. Hind-wings white, with an irregular black border at the outer margin. Thorax and abdomen white shaded with grey.

Our next example is the CINNABAR MOTH (*Euchelia jacobææ*). This very pretty insect is very plentiful in some localities, and scarcely ever seen in others. For example, about Oxford it is one of the most familiar of Moths, flitting about the fields and gardens, and its pretty caterpillar being common on the ragwort. Yet in many parts of Kent it is one of the scarcest of

Lepidoptera, although its special plant grows in profusion.

The Cinnabar Moth is almost unique among lepidopterous insects in having the upper and under sides of the wings exactly alike. The ground colour of the upper wings is deep black with scarlet marks, and that of the under wings scarlet with a black-brown band surrounding them.

The caterpillar is bright yellow with black bands extending nearly round the body, and, as it is very conspicuous, it is easily seen. If alarmed, it loses its hold of the leaves and falls to the ground. I have captured, bred, and dissected great numbers of this insect. The Rev. J. Greene, in his valuable little work, "The Insect Hunter's Companion," states that he never took more than one specimen of this Moth in England, though he captured plenty in Ireland. He also mentions the curious fact that, although he found the pupæ in boundless profusion on the bark of wych elm, he never saw the perfect insect except in this one instance.

The following is a more detailed description of the colour of this beautiful species, a figure of which may be seen in Plate III. fig. 1.

The fore-wings are of a deep bluish black, with three circular spots of pale crimson at the outer margin, and two streaks of the same colour, the first from the base to the foremost spot, the other along the hinder margin. The hind-wings are uniform crimson, the body blue-black. The underside is exactly the same as the upper, a very unusual circumstance.

Next on our list comes the Moth known by the

name of the CLOUDED BUFF (*Euthemonia russula*), Plate III. fig. 2.

This pretty but inconspicuous Moth is widely but thinly spread over England, and may generally be found in June, inhabiting open spaces in woods and on heather-covered lands. The larva, which is covered with red-brown hairs, and has a red line along the back, may be found upon the scabious and one or two other plants. The upper pair of wings are remarkable for having their colouring merely composed of different shades of the same hue: those of the male, yellowish brown shading into russet at the margins, with a central irregular dark marking. Hind-wings yellow, with dark brown markings. The fore-wings of the male are orange, with dark central mark. The male is larger than the female, and the colours of the sexes are so different that they scarcely seem to belong to the same species. The span of wing is about an inch and a half.

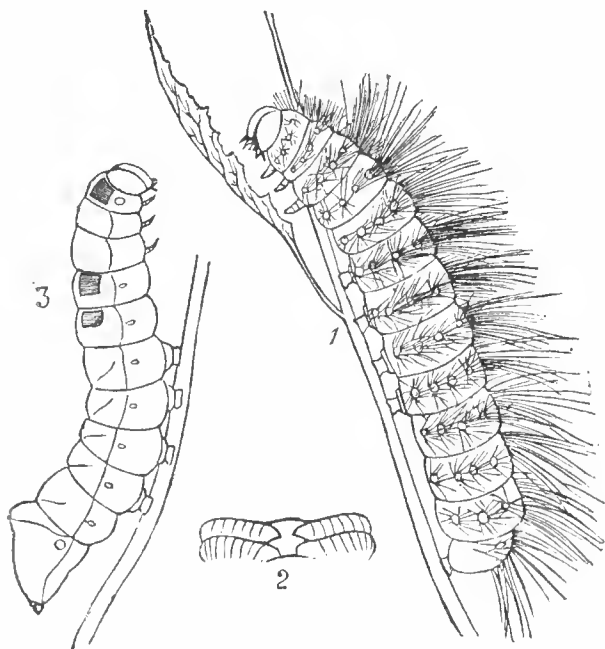
Our next example is the well-known TIGER MOTH (*Chelonia* [or *Arctia*] *carya*).

Were not this Moth so common, it would take high rank among entomologists, as one of the first of the British insects, while its extreme abundance renders it so common that it is utterly despised by collectors. It is rather a large Moth, the span of wings sometimes reaching nearly three inches.

The usual colour of the insect is as follows. The fore-wings are rich dark brown, with cream-coloured markings. The hind-wings are deep crimson, sometimes with a touch of orange, with several black spots. There is much variation



observable in different specimens in the markings both of the fore and hind wings. In the former the brown sometimes almost eats up the cream-colour, and *vice versâ*; and in the latter sometimes the crimson, sometimes the black, greatly



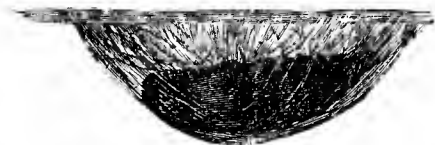
H

preponderates. Thorax brown and hairy, abdomen pale crimson.

There are indeed few Lepidoptera more variable than the Tiger Moth. Mr. Doubleday possesses a wonderful series of varieties, ranging from

an almost total absence of colour to deep black. The young entomologist must remember that almost all insects lose their colour when exposed to the light, and that if he does not keep his specimens in utter darkness the colour will fade. The Tiger Moth is very liable to fade, and some of my specimens, from which the light has not been carefully excluded, are quite pale in colour.

The larva or caterpillar is familiarly known by the name of the Woolly Bear, in consequence of the dense coating of long hair with which it is covered. A figure of this larva is shown in the illustration on the preceding page, fig. 1. It feeds chiefly on the common dumb nettle, and consumes



Tiger Moth—Hammock.

great quantities of the plant, as I can testify, from having had to feed upwards of four hundred Woolly Bears while experimenting on the comparative anatomy of the insect in its stages.

When it has finished feeding, it spins a loose kind of silken hammock (see the above illustration), and, after throwing off its larval skin, lies recumbent as a pupa until the middle of the summer, when it emerges in its perfect state. It is rather swift of foot, and when cowering in the evening among the herbage, with its brown upper wings closed over the splendid scarlet of the lower pair, it looks so like

a mouse that my cat has often been deceived, and pounced on the Moth thinking he had caught a mouse.

This beautiful Moth is shown on Plate III. fig. 3.

There is another species belonging to the same genus, namely, the CREAM SPOT TIGER MOTH (*Chelonia* [or *Arctia*] *villica*). This is a smaller and, if possible, a handsomer insect. In this Moth the fore-wings are deep brown-black with patches of creamy white, and the body and posterior wings are rich orange with black marks.

This is said to be a plentiful insect. I am inclined to consider it to be locally plentiful, but generally rather scarce. The larva is much darker than that of the preceding species, and not so hairy. It feeds upon the groundsel and one or two other plants.

The general name of *Arctia* was given to these Moths on account of the popular title of Woolly Bear which has been conferred upon their larva, and I personally much prefer it to the word *Chelonia*.

On Plate III. fig. 4, we see a figure of the large ERMINE MOTH (*Spilosoma menthastræ*).

There are several Ermine Moths, which are so called from the soft downy nature of their plumage and the dark spots with which they are variegated. It is a very conspicuous insect, and may be easily recognized from the illustration, which is given of the natural size.

The fore-wings are pale buff, with numerous black spots. Hind-wings white, with black veins and a few black spots. Thorax tufted, pale buff. Abdomen the same colour, with a longitudinal series of black spots.

Another species, the BUFF ERMINE (*Spilosoma lubricepeda*), is still more common.

The general colour is yellow buff, variegated with blackish spots, and an orange stripe runs along the back, which often become merged together and form broken and irregular lines. Both these Moths may be found sticking on the bark of trees, quite motionless during the hours of daylight.

The larva of this species has a black skin, with a moderately dense clothing of brown hair. It feeds on many plants.

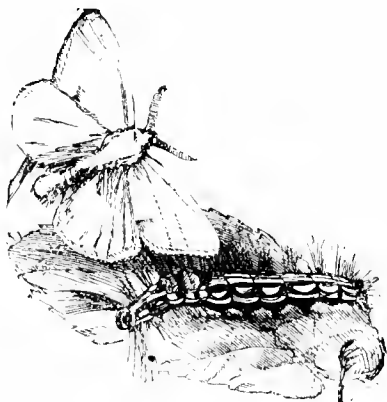
Next in order come the curious Moths belonging to the genus *Liparis*. They are remarkable for the manner in which the feather-scales are prolonged into feathery plumes at the end of the tail. This is largely developed in the female insect, and is used by her in forming a sort of pent house over her eggs. The eggs are piled in a conical heap on some flat substance, and the Moth lays over them a complete thatched roof formed of these elegant plumes.

The species represented on Plate III. fig. is the BROWN-TAILED MOTH (*Liparis chrysorrhœa*). The upper surface of the wings is pure satiny white; under surface of fore-wings tinged with brownish yellow. The thorax and abdomen are of the same colour as the wings. The tail is strongly tufted with golden brown hairs.

The larva of this moth feeds on the leaves of small trees, the hawthorn and sloe being, perhaps, its favourite resort. It is yellowish for the first few segments, and changes to pinkish orange for the rest of the body. It may be known by the long tufts or pencils of hair

which project on either side of the first segment, and the shorter tufts that are found on the rest of the body.

The larvæ are social, and spin large webs, in which they live in common. In some years this insect has been so abundant as to threaten the destruction of every tree in the place, and then has disappeared so completely that scarcely a specimen can be found in places where it formerly swarmed.

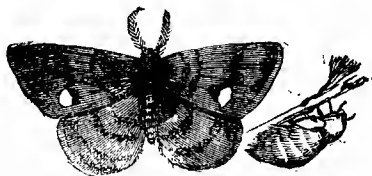


Gold-tailed Moth and Larva.

The GOLD-TAILED MOTH (*Liparis auriflua*) is somewhat like the preceding insect, but the tuft at the end of the tail is bright golden yellow. Like the Brown-tailed Moth, it has several times appeared in such numbers that the trees and hedges were quite devastated by the hosts of larvæ. The hairs of the caterpillar are very irritant to tender skins. I have been almost disabled

by them before discovering the real cause of the mischief.

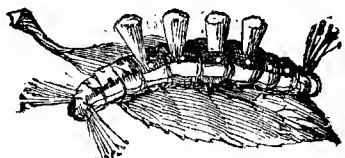
On Plate III. fig. 6, is a figure of the common VAPOURER MOTH (*Orgyia antiqua*). The wings are of a rich brown, the fore-wings with a few transverse wavy black lines, and a white spot at the



Male Vapourer and Wingless Female.

hinder angle. Thorax and abdomen the same colour as the wings. Antennæ very markedly pectinated or feathered on the inside. Female wingless, and very heavily built.

This is a very abundant species, and as it is one of the day-flying Moths. it is as conspicuous as it is abundant.



Vapourer Larva Moth.

The caterpillar is a very pretty one, dark brown, variegated with red spots, and being adorned with "tussocks," i.e. thick compact bundles of white-grey hair on some of the first segments, and

with spreading tufts of black hair on either side of the head and tail.

As for the female Moth, it is very inconspicuous, and, having no wings, is seldom captured, the generality of specimens in cabinets being obtained by rearing the larva. There is a great similarity between the wingless females of the different species, and one of them is given in Plate V fig. 5.

There is an insect allied to the Vapourer, which deserves a passing notice, more on account of its larva than for its own sake. This is the LIGHT TUSSOCK MOTH (*Dasychira pudibunda*), which derives its popular name from the flat-topped tussocks of straw-coloured hairs which decorate the back. From the twelfth segment there protrudes a tuft or pencil of reddish hair, somewhat resembling the tail of a dog. The larva is very plentiful in the hop counties, where it is known by the name of the Hop-dog. There is scarcely a year when I do not receive a box or two of hop-dogs, with a request for the name of the creature.

On Plate VI. fig. 7, is seen a Moth which has the curious name of OAK-EGGAR (*Bombyx* [*Lasio-campa*] *quercus*). The figure represents the female. She may be at once known by her pale colours, and by the simple antennæ, which have not the beautiful pectination which distinguishes those of the male insect.

This is a common Moth, but, owing to the swift flight of the males, they are more obtained by rearing from the larva than by capture with the net.

Should the collector possess a female, he may

capture as many males as he likes. All he has to do is, to put her in a box covered with gauze, take her to the borders or the open spaces of a wood, and put the box on the ground. By some strange faculty the males are enabled to detect her presence at an amazing distance, and will come in numbers to the box, over which they will crawl with such entire devotion to the prisoner that they may be picked up with the fingers. I have caught numbers of male Oak-eggars, merely by placing in my chamber a box containing a newly-bred female, and leaving the window open.

This mode of catching the males is called "sembling," and can be used with several other species of Moths.

The wings of the male are of deep chocolate brown, with a broad pale ochreish band a little beyond the centre, extending through both wings, shading off again into chocolate at the margin. A distinctly marked white "comma" is observable about the centre of the fore-wings. The thorax is dark chocolate, slightly tinged here and there with pale ochre. The abdomen is of the same pale ochre, with transverse chocolate markings at the joints.

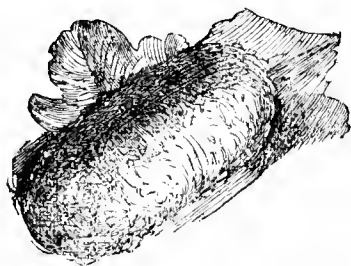
The female is much larger than the male, and the markings, though similar, are much paler. There is much variety noticeable in various specimens as to the depth of colouring in this species; the colours are peculiarly fugitive when exposed to light. They are also destroyed by the fumes of sulphur, as I found in my early entomologizing days, when I killed some of these insects with sulphur.

The larva grows to a considerable size, and is



thickly covered with hairs. This peculiarity is referred to in the generic name, *Lasiocampa*, which signifies hairy caterpillars. The junctions of the segments are marked by belts of velvet black, which are very conspicuous as the caterpillar bends its body in the act of crawling. It feeds upon various plants, and is very easy to rear.

When it is full-fed, it spins a remarkable cocoon, just like a brown egg. This cocoon, which is about as large as a sparrow's egg, though longer in proportion to its width, may often be found fastened to the stems of herbaceous plants,



Eggar Cocoon.

and the twigs of hedgerows. It is of very tough and hard material.

The next insect in our list is the Fox Moth (*Bombyx rubi*), a figure of which is given in Plate IV. fig. 2. It is a tolerably common species. The wings are of a nearly uniform reddish brown, or fox colour,—hence the name,—with two oblique lines on either side the centre of fore-wings. The thorax and abdomen are of the same colour as the wings.

As is indicated by the specific name, the caterpillar feeds on the bramble. It is remarkable for the alteration in its colour as it increases in size. When small, it is dark blackish brown, with the junction of the segments marked with belts of bright gold. As it becomes older, the gold bands vanish, and the entire larva is deep rusty red. The cocoon is comparatively a large one, permitting the pupa to move from one end to the other.

The GROUND LACKEY MOTH (*Bombyx* [or *Clisiocampa*] *castrensis*) is a rather pretty moth,



Ground Lackey Moth.

and very variable in colour. The upper wings are reddish yellow, with two darker bars, and the under wings are altogether darker. This is the usual marking, but there is so great a variety of hues

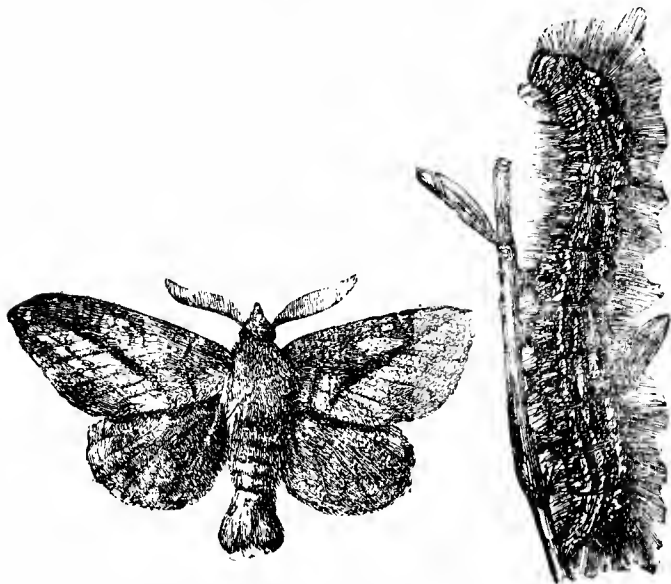
that a more detailed description is needless. The larva feeds chiefly on the herbage of salt marshes.

On Plate IV. fig. 6, is a figure of the common DRINKER MOTH (*Odonestris potatoria*). As may be seen by the illustration, this is a conspicuous, though a soberly-tinted insect; the beak-like form of the palpi, the soft downy plumage, and the deeply pectinated antennæ of the male, at once pointing it out. The remarkable forked appearance of the tail-plumage is another characteristic.

The fore-wings of the male are of a ruddy yellow, with a white spot, somewhat like that on the Oak-egg, and an oblique dusky streak or bar runs from the apex to middle of hind margin. The female is much larger and of a lighter colour than the male. Hind-wings nearly

uniform ochre, or but slightly marked. Thorax and abdomen also uniform. The tail in the male is bifid, that is, is split into two lobes or tufts; in the female it is pointed.

The gaudy caterpillar of this species, conspicuous for its handsome colouring of yellow

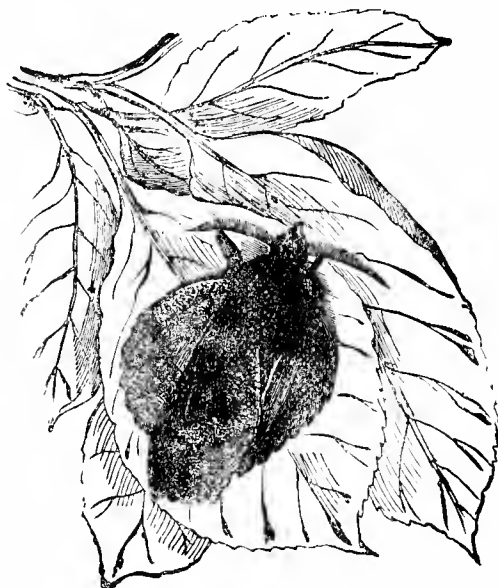


Drinker Moth and Caterpillar.

and deep chocolate brown, is common along our hedgerows, and is easily reared. It makes a spindle-shaped cocoon of much softer material than that of the Eggar Moth.

This Moth is easily attracted by light. I have caught many of them fluttering about the gas-

lamps in the streets of Oxford, and in the shop-windows, and have seen them lying disabled within the lamps, having contrived to crawl through the aperture by which the gas-pipe enters the lamp.



Lappet Moth (wings closed).

On Plate IV fig. 6, is represented the LAPPET MOTH (*Bombyx quercifolia*), as it appears with its wings spread,—when it closes them it presents quite a different aspect. (See above.)

The colour of the wings is exactly that of a brown, withered leaf, a green band near the edges

adding to the resemblance. When the insect is at rest, the hinder wings project beyond the upper, and make it look so exactly like a dry crumpled leaf, that even a practised eye will often fail to detect it as it clings to a twig.

The caterpillar grows to a considerable size. It is grey, hairy, and remarkable for the dark, velvet-like bosses in the second of the segments. It feeds on many herbs and trees, and is so readily discovered and easily reared, that almost any number can be procured in a single season.

The Moth which is known by the popular name of the KENTISH GLORY (*Endromis versicolor*), was once, as its name implies, found in Kent, and was one of the rarest of British insects. Other haunts of this Moth have, however, been now discovered; and the insect, though not a very common one, is no longer a rarity. It has been principally found in the Rannoch woods near Perth. It owes its reputation more to its former rarity than to the beauty of its colour. The fore-wings are variegated with varied wavy parallel markings of deep rich brown, orange tawny, and pale yellow, fading almost into white. These markings are continued into the hind-wings, which, however, have a groundwork of yellow, deepening into rich orange at the hind margin. In the female the markings are much the same, but a pale grey takes the part of the yellow and a faint blush pink of the orange. The thorax and abdomen are dark brown, with a faint shading of yellow in male and pink in female.

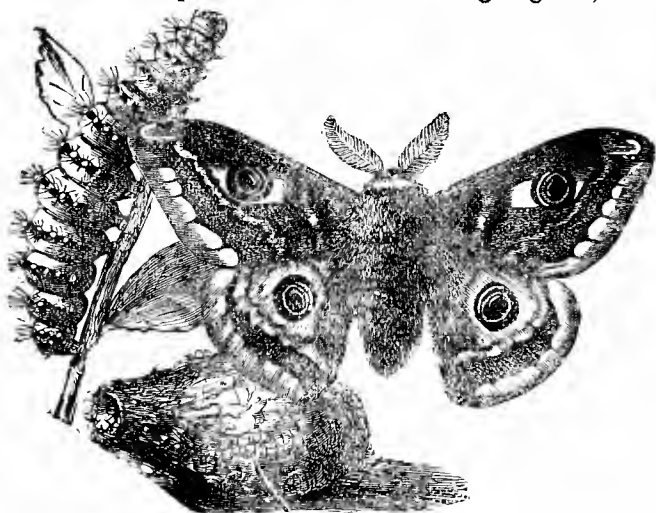
The larva of this species feeds on several trees, of which the birch, the lime, and the hazel seem

to be its favourites. The Moth is shown in Plate IV fig. 3.

Here must be mentioned the beautiful EMPEROR MOTH (*Saturnia pavonia-minor*).

This insect is equally remarkable in its three stages of existence.

The larva is one of the handsomest of the British caterpillars. Its colour is bright green,



Male Emperor Moth, Larva, and Cocoon.

belted with black, and each segment is very deeply marked, as if a number of threads had been tightly bound round the body. Each segment is adorned with a number of tufts of golden yellow spots, from which proceed little tufts of bristles.

In shape the Moth somewhat resembles the

Oak-eggar (see Plate III. fig. 7) ; but it is easily known by the eye-like spot in each wing. The centre of the eye is yellow, surrounded with black, and having a blue crescent partly surrounding it.

Before the larva assumes the pupal state, it spins a most singular cocoon. This cocoon is double, a loose outer envelope enclosing an inner



Emperor Moth—Cocoon.

cocoon made of stiffer hairs. The ends of these hairs converge over the opening, so that the Moth, when it shakes off the pupal skin, can easily creep out, while no other insect can creep in. The structure of the cocoon is shown in the accompanying illustration. The larva of the Emperor Moth may generally be found upon the heath. The form of the antennæ is shown in cut G, fig. 3, page 17.

## CHAPTER II.

### THE GEOMETER MOTHS.

WE now come to the GEOMETRÆ or LOOPERS, a very large family of Moths, which derive their name from the curious mode of progression employed by the larvæ.

The name of Geometræ signifies "earth measurers," and is given to them for the following reasons:—

Instead of crawling like other caterpillars, they seize some object with their front legs, and then draw up the tail so as to form the body into a loop. They then grasp with the claspers, or false legs at the end of the body, and stretch themselves out to seize another object with the front legs. Thus they have a fanciful resemblance to those Indian devotees who "measure the way" to their place of worship by prostrating themselves on the ground, marking the spot where their outstretched hands rest, placing their feet on that spot, and prostrating themselves afresh.

The more popular name of Looper is given to them because the body is drawn up in a loop at every step.



The power of grasp displayed by these caterpillars is enormous in proportion to the size of the creature. Some of the Geometræ, which are coloured greenish brown, are in the habit of grasping a branch with their hind claspers, and stretching themselves out in a straight line. This position they will retain for hours together, and look so exactly like twigs that even the caterpillar-hunting birds are deceived, and pass them by.

One of the best examples of this description of caterpillars is the larva of the insect that heads the Geometræ, namely, the SWALLOW-TAILED MOTH (*Ourapteryx sambucata*). As its specific name implies, the caterpillar is found on the elder, though it is not confined to that tree, but sometimes takes to several other trees and plants. It is brown in colour, with a few stripes along the sides, and, when it is stretched out stiff from a branch, it has the most singular resemblance to a twig, the knobs upon its body looking like buds.

The Moth derives its popular name of Swallow-tail from the peculiar form of the hind-wings, which are prolonged into points something like those of the swallow-tail butterfly.

The wings are of a uniform pale primrose yellow. The fore-wings have a dark greenish streak beyond the centre, and another inside it passing on across to the inner angle of the hind-wings. The hind-wings terminate in a tail. The thorax and abdomen are uniform with the wings, the latter slightly marked transversely with dark greenish stripes. (See Plate IV. fig. 5.)

These colours are very delicate, and the wings

are very thin and fragile. The insect is exceedingly common, and may be taken in the dusk of the evening as it flies about, and also captured in the daytime by beating the bushes in which it lies hidden during the hours of daylight. When Bagley Wood near Oxford was in its prime, this Moth was continually flying out of the bushes as the entomologist passed among them.

This Moth is the sole British representative of its family, the Ourapterydæ.

OF the next family, the Ennomidæ, we have more than twenty examples, four of which will be found in this book.

The first of these is that exceedingly variable insect, the ORANGE MOTH (*Angerona prunaria*). Not only is there a marked difference between the colours of the sexes, the wings of the male being dark orange, while those of the female are yellow, but in many instances the brown takes the place of the yellow or orange, the original colour only showing itself in bands or blotches.

The caterpillar is as variable as the moth, and has very much the same colours, brown always predominating. It may be generally found on the blackthorn and beech, but also feeds upon the plum, from which circumstance it takes the name of *prunaria*. Independently of the darker colour, the male may be known by the beautifully-pectinated antennæ. The expanse of the wings is nearly two inches. (See Plate IV fig. 4.)

Another common species is the LIGHT EMERALD MOTH (*Metrocampa margaritata*), so called from the colour of its wings, which are of a delicate

green, traversed by narrow white stripes, two stripes crossing the fore-wings and only one the hind-wings. It is about the same size as the preceding insect.

Mr. Newman states that he has found the caterpillar upon the broom, but thinks that it may be a general feeder. It is remarkable for having six claspers at the end of the body instead of four, which is the usual number in the larvæ of *Geometræ*, and is olive green, with a dark line along the back and a series of whitish marks along the sides.

The BRIMSTONE MOTH (*Rumia cratægata*) is still more common, and may be found plentifully throughout the greater part of the summer. It is a very pretty insect, the wings being of a light brimstone yellow, and the "costal margin" of the fore-wings being adorned with some reddish brown spots. The caterpillar is plentiful in white-thorn hedges, and is remarkable for the fact of having eight pairs of claspers, and only using two pairs.



Brimstone Moth Larva.

Less conspicuous is the SCORCHED WING MOTH (*Eurymene dolobraria*), an insect which derives its name from the colour of the upper wings, which look exactly as if they were made of irregularly scorched paper. The figure on Plate V fig. 3, will give a good idea of its appearance,

and will show the slightly angular form of the wings. The general colour is pale brown, and the slight lines that are seen crossing the wings are blackish brown. The hind-wings are also pale brown, but of a much lighter hue than the upper pair.

The Moth may be found any time about mid-summer, and can mostly be taken in the neighbourhood of oak and beech, on which the caterpillar feeds.

The reader will observe that the angular form of the wings is found in a greater or less degree throughout the whole of the present family of Moths, which perhaps from this peculiarity have received the popular and rather fanciful name of Thorns. Some of these are known by other popular names, the worst of which is, that the name generally conveys no sort of idea of the insect. One of these Moths is the well-known BORDERED BEAUTY (*Epione apiciaria*), one of the prettiest members of this family. It is much smaller than those which have already been described, being little more than an inch in expanse of wing. The peculiarity of this Moth is, that both pairs of wings are surrounded by a broad band of purplish brown, the rest of the wings being orange. It flies about the end of summer and beginning of autumn, and is very common.

A rather rarer species, the DARK BORDERED BEAUTY (*Epione vespertaria*), bears some resemblance to the preceding insect, but may be known from it by the purple-brown dots which are scattered over the orange part of the wing. The wings of the female are yellow instead of orange.

We now pass on to the LUNAR THORN (*Selenia lunaria*), so called from the brown semilunar marks at the tips of the wings. A figure of the female is given in Plate V fig. 2. The male has pectinated antennæ, and the wings are much darker. The general colour is pale reddish brown, barred with a darker brown. Upon the bar that crosses the middle of the upper wings is a tiny crescent-shaped mark nearly white. A similar, but paler mark occurs in the band that crosses the hinder wings.

The insect flies in the beginning of summer, and the larvæ can be taken on the blackthorn at the end of autumn.

There is another Moth which may easily be mistaken for the preceding insect. This is the PURPLE THORN (*Selenia illustraria*), which is very similarly coloured, has the dark brown mark at the tip of the wing, the dark band across the wings, and the semilunar white mark. There is, however, a decided purple hue about the basal half of each wing, which serves to distinguish it from its congener. The dark band, too, is more decidedly marked.

Last of the Thorn Moths comes that pretty and rather conspicuous insect, the FEATHERED THORN (*Himera pennaria*). See Plate V fig. 1. This Moth is about an inch and three-quarters in span of wing, and the antennæ of the male insect are thickly *feathered*, whence the specific name. In the female they are simple. Fore-wings pale reddish grey, with three distinct transverse blackish bands, margins wavy, not scalloped. Hind-wings pale greyish yellow at base, deepening into ruddy ochre and thence

into blackish grey at the margin. Thorax and abdomen similarly coloured of a pale yellowish grey.

There is a conspicuous spot at the tip of the fore-wings, white in the male and grey in the female. The beautiful antennæ of the male are remarkable for the white hue of the shaft, which contrasts prettily with the brown featherings. The wings of the female are narrower than those of the male. The Moth, which is plentiful in most parts of England, flies about the end of autumn, and the caterpillar may be taken towards the end of spring, as it feeds upon the oak.

The reader may as well bear in mind that the oak is a perfect treasury of caterpillar life. The simplest mode of taking the larvæ is to have a sheet held under the branches, and then strike them smartly with a stick, when a wonderful number of caterpillars will come tumbling into the sheet.

For the higher branches, the sheet cannot be used, as the fall would damage the larvæ, many of which are peculiarly delicate, and cannot endure rough usage. In these cases, the butterfly-net is useful, being held under the branch with one hand, while the other hand taps the bough with a stick. Sometimes, when the entomologist is obliged to hold a branch with one hand, the net itself can be neatly tapped under the bough so as to catch the caterpillars as they fall.

WE now come to some of those remarkable Moths the males of which are winged and beautifully marked, while the females are either

wholly or partially wingless. Practically, they are wingless, for even in those cases where the wings are tolerably conspicuous they are much too small for the purpose of flight.

The first of these insects is the PALE BRINDLED BEAUTY (*Phigalia pilosaria*), Plate V figs. 4 and 5.

It is very difficult to describe this insect, as its colours are very indeterminate, and scarcely any two entomologists have described it in exactly the same terms.

Unlike the angled wings of the preceding insects, those of the present family, *Amphydasydæ*, are nearly rounded. The fore-wings are a pale reddish grey, with a very faint tinge of green, and crossed by four indistinct bars of a darker green or brown. The hind-wings are somewhat similarly coloured, but are paler.

There is an odd and almost indescribable look about the wings, which have a hairy or "pilose" appearance, giving rise to the specific title *pilosa*, and they look much as if they had been much worn and rubbed. The expanse of wing is about two inches, or a little less. The male is a very common insect, and it flies about the beginning of spring.

As for the female, it is so odd-looking a creature that no one except an entomologist would take it for a Moth. A figure of it may be seen on Plate V fig. 5.

The wings are totally absent, so that the insect is obliged to restrict herself to the tree in which she has passed her caterpillar life. It is a very inconspicuous insect, and would readily evade the observation of any one whose eye was

not trained to perceive it. Indeed, this and other wingless females were originally discovered by rearing the caterpillars, and this is by far the best method which the young entomologist can follow. The caterpillar feeds on oak, and is said to be found on several other trees.

In connection with this insect, I must mention another, which derives some interest from the fact that it was only discovered to be a British species in 1863. It is the BELTED BEAUTY (*Nyssia zonaria*), so called from the manner in which the black abdomen of the perfect insect is crossed with six orange belts. The male is a pretty little insect, the wings being grey, boldly streaked with darker grey and brown.

As far as is at present known, it is a local insect, all the specimens having been taken in Cheshire, near the sea. In those places, however, it is tolerably plentiful, and considerable numbers of both sexes have been bred from the caterpillars. Eight specimens were sent to me in one box, so that the Moth can now scarcely take rank among the rarities.

A closely-allied species, the SMALL BRINDLED BEAUTY (*Nyssia hispidaria*), is common in several localities, and in the New Forest, where the caterpillar may be found feeding on the oak, and the pupa dug from the roots of that tree. This Moth, though much smaller, is exactly like the Pale Brindled Beauty.

Next we come to the handsome, though not brilliantly coloured insect, the OAK BEAUTY (*Amphydasis prodromaria*). The fore-wings are whitish-grey, speckled, and in parts clouded, with black. The hind-wings are similarly marked,



but paler. The thorax and abdomen are stout and strikingly hairy. As is the case with many Moths, the antennæ of the male are feathered, while those of the female are simple. The expanse of wing is about two inches.

The caterpillar is one of the many oak-feeders, and the Moth flies at the beginning of spring. A male insect is shown at Plate V. fig. 6. The wings of the female are somewhat different in their markings.

At fig. 7 of the same plate is seen a figure of the female PEPPERED Moth (*Amphydasis* [or *Biston*] *betularia*). By looking at this and the preceding Moth, few indications are perceived that the insects belong to the Geometræ, and that the caterpillars are, as in this case, true Loopers.

The popular name of this insect exactly represents its appearance, the wings being greyish, sprinkled profusely with blackish brown dots and streaks, the markings being as variable in different specimens as if the black marks had been shaken at random out of a pepper-caster.

The caterpillar, which feeds on many trees, such as the lime, birch, oak, &c., is as variable in appearance as the perfect insect, the ordinary hue being brownish, with a tinge of green or mahogany. The pupa may be dug out of the ground at the foot of the trees on which it feeds while in the larval condition. The Moth flies about May. The male Peppered Moth is smaller and darker than the female, and has the antennæ deeply feathered.

There is a closely-allied insect, the BRINDLED BEAUTY (*Biston hirtaria*), which is in some years much too plentiful to please the gardener

the caterpillars feeding on the plum, the pear, and other fruit trees, and sometimes occurring in such numbers that the trees are seriously injured, and the crop of fruit either lessened or totally destroyed.

The wings are greyish brown, and the forewings are banded with six blackish belts, the hindwings having only three belts. Both pairs of wings have a sort of woolly look, owing to the number of hair-like scales upon their surface. As it is very plentiful in London, it has gained the popular name of Cockney. It is one of the early-flying Moths, being seen in March and April.

WANT of space compels us to omit the family of Boarmidæ, and proceed to the typical family of the Loopers, the Geometridæ.

Chief among them is the LARGE EMERALD MOTII (*Geometra papilionaria*), certainly one of the handsomest of its kind, and pre-eminent both in size and colour. The expanse of wing is about two inches and a quarter. Both pairs of wings, abdomen, and thorax are uniform bright grass or emerald green, with two parallel transverse wavy lines of a lighter shade. The abdomen is slender.

Unfortunately for collectors, the colour of this Moth is as fleeting as it is beautiful, and the greatest care must be taken to keep it in the dark, in order to prevent the bright emerald green from fading away until scarcely an idea can be formed of the original colouring. This sensitiveness to light is found in the colouring of many insects, but there are very few in which

the tints fly so quickly as is the case with the present insect.

The caterpillar is also green, being one of the few instances in which the larva and the perfect insect coincide in colour. It feeds on various trees, the birch and beech being perhaps its favourites, and the Moth flies in midsummer. Woods are the best places in which to search for this beautiful Moth, a figure of which is shown on Plate V fig. 8.

The present family contains some eight species, all going by the popular name of Emerald, though the title is not so well deserved as by the insect just described. The GRASS EMERALD (*Pseudoterpna cytisaria*) is one of them. It is much smaller than the Large Emerald, and has its wings of a greyish green, with a pair of dark bands crossing the fore-pair. Mr. Newman mentions in his valuable work on the British Moths, that "when this Moth comes out of the chrysalis in wet weather, every part of it is suffused with a red tinge."

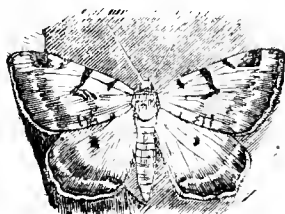
Another is the COMMON EMERALD (*Hemithea thymiaria*).

In this pretty little Moth, all the wings are dark green, and are marked by a slight wavy white line. The hind-wings are boldly angled at their tips, so that they approach the swallow-tail form, and they are figured with greyish white speckled with darkish grey or brown.

A tolerably common example of the family Acidaliæ is found in the V MOTH (*Halia vararia*), which is here shown of the natural size.

The colouring is not easy of description, but it is mostly grey, diversified with numerous

brown markings, and having a peculiar purplish bloom. The larva is exceedingly variable in colour, some specimens being slate blue, and others dark olive green. It may, however, be known by the numerous black knobs with which its body is covered, each knob supporting a single stiff hair. This caterpillar is to be found on the gooseberry.



V Moth.

WE are again obliged to omit one or two families, including the whole of the Caberidæ and Macaridæ, among which are a great number of the "Wave" and other Moths, and to proceed to the VESTAL (*Sterrhæ sacraria*), a Moth belonging to the family Fidoniidæ. A figure of this Moth may be seen on Plate VI. fig. 2.

The wings of the male are pale yellow, diversified with a pinkish stripe along the upper edge, and another stripe crossing the wing diagonally. The antennæ of the male are feathered for rather more than half their length, while those of the female are simple, as seen in the illustration.

The caterpillar feeds on several plants, such as the common dock, and is rather a pretty larva, its colours being green of several shades, with a pale stripe running along the back. When it has finished feeding, it envelopes itself in a silken hammock fastened to the stems of the plant on which it fed. The Moth flies at the end of the summer and beginning of autumn.

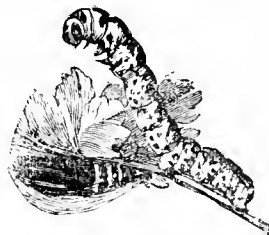
A more abundant example of this family is the GRASS WAVE (*Aspilates strigillaria*). It is a much larger insect than the preceding species, and is very prettily though not brilliantly marked. The general colour of the wings is grey, peppered with tiny dark dots and crossed diagonally with light brown stripes, three on each wing. The caterpillar feeds on the common ling, and the Moth flies about the middle or end of June.

THE next insect is the common CURRANT or MAGPIE MOTH (*Abraxas grossulariata*), one of its popular names being derived from the nature of its food, and the other from the magpie-like character of its markings.

To describe the exact colour and positions of its markings is utterly impossible, on account of the extreme variations to which it is subject. It is, indeed, so variable a Moth in its aspect, that even a beginner at Moth-hunting is sure to find several well-marked varieties, and will sometimes mistake them for different species. The general nature of the markings may however be described as follows:—The fore-wings are white or whitish grey, and have a yellow band crossing them in the middle, and a patch of the same colour at the base. Over the wings are spread numerous black or dark brown spots, arranged without any particular order, but usually following the line of the margin, and grouped on either side of the yellow stripe. The hind-wings are marked in much the same manner, with the exception of the yellow stripe.

Sometimes the black spots are so large and so

numerous that they cover nearly the entire wing ; sometimes the whole of the wing is black except a patch at the base ; while in some specimens the marks are so few and so pale that they scarcely seem to exist at all, and the Moth is nearly white. Yet, in spite of these many varieties, there is a sort of character about the Moth which renders it recognizable at once to a tolerably practised eye, though a beginner might easily be deceived. The figure on Plate VI. fig. 1, gives a good idea of the general appearance of this Moth.



Currant Moth, Larva and Pupa.

It is one of the commonest British insects,—far too common, indeed, to please the lovers of gardens. The caterpillar feeds on the currant and gooseberry, preferring the former, and may in some years be found in hundreds upon the leaves and twigs. It is rather a pretty caterpillar, and partakes much of the colouring which distinguishes the perfect insect. The body is cream-coloured, partly ringed and spotted with black, so that it would be exceedingly conspicuous were it not for its habit of keeping itself very still, and generally in a line with a twig.

As is the case with many silk-spinning cater-

pillars, it uses its thread-producing powers as a means for securing its safety ; and if the branches be tapped, or if it be suddenly alarmed, it fixes a thread to a twig, and quickly lowers itself towards the ground, swinging backwards and forwards at the end of its thread until the fear of danger has passed away, when it returns to its branch, and resumes the meal on which it is almost perpetually engaged.

The pupa or chrysalis of this Moth is dark mahogany-brown in colour, banded with yellow, so that in this insect we have the curious and nearly unique fact that the larva, the pupa, and the Moth are all marked with the same hues.

Another of the Magpie Moths is seen on Plate VI. fig. 4. This is the CLOUDED MAGPIE (*Abraxas ulmata*), an insect which is, to my mind, a handsomer one than its more conspicuous relative.

The body of this insect is marked much like that of the common Magpie Moth, and the colours of the wings are of a similar character, though in general much paler, and having much more yellow in them. The arrangement of the marks can be understood better from a reference to the figure, than by a detailed description. The darker patches are yellowish brown, each relieved with silver grey, while the lighter markings are blackish grey.

This rather pretty caterpillar feeds on the elm. Its colour is grey with a slight tinge of blue, dotted with black, and with a yellow streak on each side.

In some parts of England this Moth is nearly as plentiful as the preceding species, whereas in others it is seldom seen. About Oxford it *may*

be reckoned as one of the varieties. It appears about midsummer.

ON Plate VI. fig. 6, may be seen a figure of a Moth which is far more pretty and plentiful than agreeable. This is the WINTER MOTH (*Cheimatobia brumata*), which, as its name implies, is one of the few Lepidoptera that venture abroad during the winter months. Like all moths and butterflies, the Winter Moth cannot endure wind, and a north-easter is utterly detestable to it. But, on tolerably still days, it may be often seen flitting along hedges during the two or three last months of the year, occasionally settling, and, if startled, slipping through the hedge so quietly that it often escapes capture, though it is decidedly slow of wing.

This Moth is one of our most destructive insects, the caterpillar being particularly fond of fruit trees ; and in some districts, especially those in which apples, plums, and cherries are much cultivated, the young larvæ cut their way into the buds, and destroy in this manner a great proportion, and sometimes the whole, of the crop.

When they are too large to be hidden in the buds, they attack the young leaves, spinning threads round two or three of them in such a manner that the caterpillar may be concealed in them. The silken thread is also used by them as a means of safety ; for, if the branches be beaten or shaken, the caterpillars allow themselves to drop, suspending themselves by their threads, and, when the danger is over, climb up again to resume their ravages.

The same threads are employed by them when



they are full fed and about to undergo the change into the pupa. They let themselves down to the ground, burrow into the soil, undergo their transformation, and then ascend into the outer air in the perfect state.

Fortunately for the proprietors of orchards, the female is without wings, so that she is obliged to creep up the trunks of the trees in order to lay her eggs, and may be intercepted by various means.

The most effectual plan seems to be a coat of some sticky substance applied in a broad ring round the stem, and continually renewed as fast as it hardens. Mr. Newman recommends a mixture of Stockholm tar and cart-grease. This, however, must only be applied in November and December, as it dries too fast in the warmer portions of the year. When the female Moths try to ascend the tree, they are caught in the tar; and in some places where the insect is plentiful, the tar-belt is as thickly covered with Winter Moths as is the "catch-'em-alive" of the street hawker with flies.

As it is probable that some of the insects may have escaped the tar, and have scaled the tree before it was applied, they may be seen by visiting the trees after dark, and directing the light of a lantern upon the stems and lower branches. The males may be allowed to go free, but not a female should be permitted to escape, as each will produce, on an average, about a hundred caterpillars.

The Winter Moth is one of the many insects that have devastated districts in which the small birds have been exterminated under the idea that they destroy the fruit.

The beautiful pectination of the antennæ of the male Winter Moth is shown on cut H, fig. 2, p. 37

AN example of the Carpet Moth is seen on Plate VI. fig. 5. This is the GREEN CARPET (*Larentia pectinataria*), a pretty Moth which derives its popular name from the greenish hue that predominates in the colouring of the forewings. The thorax and abdomen are also green, the latter having each segment edged with white, and a row of black dots down the middle. The marks on the wings are blackish brown, and most of them have an edging of white. The larva feeds on the bed-straw, and seldom emerges from the roots, where it conceals itself. Six or seven species of *Larentia* are known to entomologists.

Of the great genus *Eupithecia*, which includes more than forty species, two examples are given. The Moths that belong to this genus are called by the popular name of Pug Moths—why, is not easy to say.

These Moths have both pairs of wings of a uniform character of pattern, the lines or marks of the upper pair being generally repeated in the lower pair; and as the colours are sober, and the Moths have a habit of fluttering themselves with out-stretched wings against tree trunks, palings, and similar other objects, they can only be detected by experienced eyes. Many of the species may be captured by striking a sharp blow upon any tree, post, or paling, when the startled moths fly off and may be taken in the net. Even with large trees, an energetic blow from the sole of the foot is sufficient to start the Moths.

Our first example is the SMALL BRINDLED PUG, sometimes called the SHADED PUG (*Eupithecia subumbrata*), Plate VI. fig. 8. This, like all the Pug Moths, is a small insect, the figure being of the natural size. The fore-wings are dullish grey, rather darkened towards the margins. The hind-wings are coloured in much the same manner, but their tints are paler.

Another species of this genus is seen on Plate VI. fig. 9. This is the GREY PUG (*Eupithecia castigata*).

As its name implies, the general hue of the wings is grey, and the upper pair are covered with narrow wavy bands of blackish grey. The hind-wings are paler grey than the upper pair, and there is a slight discoidal spot, not marked in the figure. As is the case with most of the Pug Moths, the caterpillars of both these species burrow into the ground after they are full fed, and make for themselves an earthen cocoon.

Some of these Pug Moths are extremely injurious to gardens and orchards. One of these insects, the GREEN PUG (*Eupithecia rectangulata*), is very plentiful in this country, the caterpillar infesting the apple and pear, among which trees it sometimes works great mischief, attacking the blossoms and buds, and so destroying the future fruit. The caterpillar is very small, and when it has entered an opening bud it draws the edges of the petals together, so that it is completely sheltered, and then proceeds to eat away the very heart of the flower, finishing by devouring the young fruit itself.

The caterpillar even remains in the flower when it has finished feeding, and further pro-

fects itself by spinning a silken cocoon, in which it remains until it changes into the perfect condition. The double protection afforded by the shelter of the dried petals and the silken cocoon is needed because this flower, together with the injured fruit, is blown from the tree and falls to the ground.

The colour of the fore-wings is green, diversified with a number of wavy dark lines, and there is generally a dark belt near the wing. The hind-wings are also greenish, and, as its name implies, this hue characterizes the whole of the body as well as the wings. It is, however, an exceedingly variable Moth, and many specimens have scarcely a tinge of green about them.

ON Plate VI. fig. 10, is seen the figure of the EARLY TOOTH-STRIPED MOTH (*Lobophora lobulata*). This Moth derives its specific name from the fact that in the male there is a small lobe at the base of the hind-wings.

The rather pointed upper wings are pale grey, traversed by several wavy bands of dark grey, which, however, are in many cases so faint that they can hardly be seen. A row of black dots runs along the hind margin.

The caterpillar of this Moth feeds on the honey-suckle and willow, and when full-fed descends to the ground, and thereupon spins a silken cocoon, in which it passes into the perfect state. I never bred this Moth, but Mr. Newman states that, when it is fresh from the chrysalis, it is sometimes of a beautiful bright green. As its popular name implies, this is one of the early Moths, making its appearance in April.

ONE of our prettiest Geometer Moths is the PURPLE BAR (*Melanthia ocellata*), a figure of which may be seen on Plate VI. fig. 7.

The colour of the fore-wings is a rich creamy white, crossed with a broad belt or bar of deep brown crossed with purple. There is also a triangular patch at the base of the same hue. There are also sundry smaller markings, which are of little consequence, especially as the broad purple-brown bar is sufficient to distinguish the Moth from any other insect, and the small marks are apt to be rather variable. The hind-wings are nearly white, as is the abdomen, the head and thorax being black.

This is one of the summer Moths, and is found in June. The caterpillar feeds on the bed-straw, and if annoyed or alarmed drops into the ground, where it lies until it believes the danger to be over. When full-fed, it spins a web which binds together the stalks of the plant on which it has been feeding, and within this shelter it changes to the perfect state.

PRETTY and conspicuous as is the preceding Moth, it cannot be compared, as to the latter quality, with the ARGENT AND SABLE (*Melanippe hastata*), a Moth which is almost startling by the strong contrast of colours which it exhibits, and the bold manner in which the opposite hues of deep black and pure white are arranged. A figure of this Moth is shown in Plate VI. fig. 11; and as the colours are simply black and white, a glance at the figure will give a better idea of the insect than any amount of detailed description.

The ordinary arrangement of colours is shown in this figure ; but, like many Moths, this insect is liable to variation, and, although the colours remain the same, their proportion is altered, the white predominating greatly over the black.

The caterpillar feeds chiefly on the birch, drawing the leaves together with silken threads, and living in the midst of them, where it finds at the same time shelter and food. The Moth appears about June.

The reader must remember, by the way, that the time mentioned for the appearance of any insect can never be definitely fixed, and must only be looked upon as an approximation to exactness. The same species appears at different times in different parts of England, and the time of appearance is always hastened when the weather is warm, and delayed when it is cold.

The genus *Melanippe* is a large one, and contains some singularly pretty Moths. There is, for example, the SMALL ARGENT AND SABLE (*Melanippe tristata*), in which the wings are almost entirely black, a broad white bar crossing their centres, accompanied by several very narrow white streaks. The caterpillar of this Moth (which is much smaller than the preceding insect) feeds on the bed-straw, and when it is full-fed it descends the stem of the plant on which it has fed, spins a cocoon near the ground, and therein undergoes its changes.

Another example of this genus is shown on Plate VI. fig. 12. This is the CHALK CARPET (*Melanippe procellata*).

The ground colour of the fore-wings is cream-

white, and the bold and conspicuous marks are rich brown, sometimes assuming a mahogany hue. The hind-wings are whitish grey, with a few wavy lines of a darker grey.

This pretty Moth is one of the summer insects, seldom occurring earlier than May or later than the beginning of August, though exceptional cases will sometimes occur. In some parts of England it is very plentiful, in others moderately so, and in others scarce; while in some, such as the northern counties, it is scarcely if ever seen. The caterpillar feeds on the well-known wild clematis, popularly called the Traveller's Joy, and remains on the plant until it attains its perfect state, passing the winter in a silken cocoon.

To this genus belong the Carpet Moths proper, though the name is given to several Moths belonging to other genera. They derive their popular name from the distribution of their colouring, which is fancifully thought to bear some resemblance to the patterns on carpets. It is to be wished that the designers of carpets would, in their turn, take their patterns from the moth-wings, as in that case we should avoid the daily offence to artistic eyes caused by the glaring patterns and ill-arranged colouring which disfigure the carpets of nine houses out of ten.

The most plentiful of these Moths is the GARDEN CARPET (*Melanippe fluctuata*), an insect which is perhaps one of the most common of all the Geometer Moths. Like many other plentiful Moths, it has two broods, one in the spring and the other in the autumn.

The colour of the fore-wings is grey, with a patch of dark grey-brown at the base, then a grey space, then a broad belt of brown, then grey again, and then an irregular dark stripe round the margin.



## CHAPTER III.

### CUSPIDATES.

WE have now completed our survey of the great tribe of Geometer Moths, and proceed to the next tribe, that of the Cuspidates, so called because in very many species the shape of the larva, instead of being rounded, is scooped and grooved so as to produce several projecting points or "cusps." We shall see some examples of such larvæ in the course of the following pages.

As a rule, the Cuspidates are very much larger than the Geometers, and indeed many of them rank among our largest Moths. The larvæ are, therefore, very large; but in spite of their size are not conspicuous, their tints harmonizing so well with those of the plants on which they live, that it is almost impossible to detect them. Moreover, they have an odd habit of remaining perfectly still for a wonderfully long time, sometimes retaining the same position for several days together, so that they possess a similar mode of defence to that which is employed by so many of the Geometer caterpillars.

Without further comment, we proceed to our first example of the Cuspidates,—namely, the PEBBLE HOOK-TIP (*Platypteryx falcula*), a figure of which is seen on Plate VII. fig. 1. The specific name, *Falcula*, signifies a little sickle, and the reader will see by reference to the figure that the name has been given to it in consequence of the curved shape of the fore-wings.

This is a tolerably plentiful insect, and is double-brooded, one set making its appearance about May and the other about September. The colour of the upper wings is reddish brown, irregularly striped with a darker tint. There is always a round patch of this dark colour in the middle of the wing. The lower wings are much paler than the upper, and are crossed by five slight bars of a rather darker hue.

The larva of the Pebble Hook-tip feeds on the birch, and has a way of doubling over the leaves and tying them with silken threads so as to form a kind of house for itself. Two other species of Hook-tip Moths are known in England,—namely, the Oak Hook-tip and the Barred Hook-tip.

WE now come to a singularly interesting insect, popularly called the PUSS MOTH (*Cerura*, or *Dicranura*, *Vinula*). A figure of the female insect is seen on Plate VII. fig. 3; the male resembles it in general appearance, but is smaller in the body, rather darker in the markings of the wings, and the antennæ are strongly pectinated. The general arrangement of the markings are to be seen from the figure, and it will suffice to say that their colour is blackish, and that the ground

hue of the wings is white. The body is covered with soft and downy feathers, which, from their fur-like appearance, have earned for the insect its popular name of Puss Moth.

Pretty as is this insect, it is in its larval and pupal stages that it is most interesting. The larva is a most singular-looking caterpillar, whose general appearance can be understood from the accompanying illustration. The colour is a beautiful leaf-green, diversified by a narrow



Caterpillar of the Puss Moth.

white stripe that forms a sort of St. Andrew's cross upon the body, the point of junction being on the hump.

The most remarkable part of this creature is the tail, which is terminated by a couple of rough, horn-like appendages. If the caterpillar be irritated, it projects from each of these horns a slender scarlet thread, which has rather a menacing aspect, though in fact it is perfectly

harmless. When several of these larva are kept in captivity, they have an odd habit of nibbling at each other's tails and gnawing them almost to the root. They also eat their own cast skins after each moult, just as do the frogs and toads. The attitude in which the caterpillar is drawn is a favourite one, and is so unlike that of most caterpillars, that few persons who are unacquainted with entomology will venture to handle so strange-looking a creature. To add to the threatening aspect of the larva, it has the power of ejecting from an aperture under the head a fluid which may perhaps have the power of keeping off certain foes, but which has no effect upon the human skin.

The caterpillar feeds upon the willow, and when it is full-fed it crawls down the trunk of the tree and gnaws a slight oval hollow in the bark. With the fragments of the bark and a glutinous secretion which it ejects, it constructs a cocoon of wonderful hardness, so hard, indeed, that a strong knife is required to make any impression on it. Being formed of the bark, it is so closely assimilated in colour and general appearance to the trunk of the tree that detection is almost impossible.

On the first occasion that I ever possessed one of these larvæ, it was put to great inconvenience. It had been brought to my rooms at college while I was out, and the servant had placed it on the stone mantelpiece and covered it with an inverted tumbler to prevent it from escaping. The larva happened to be full-fed, and was constrained by instinct to prepare its cocoon. It could find no material either in the tumbler or the mantel-

piece, so it was forced to content itself with the gummy secretion alone. With this it contrived to form a cocoon partly attached to the glass and partly to the stone on which it rested, and so hard was the cocoon, which was nearly as transparent as the tumbler itself, that the glass was fixed tightly down, and could not be removed without much difficulty.

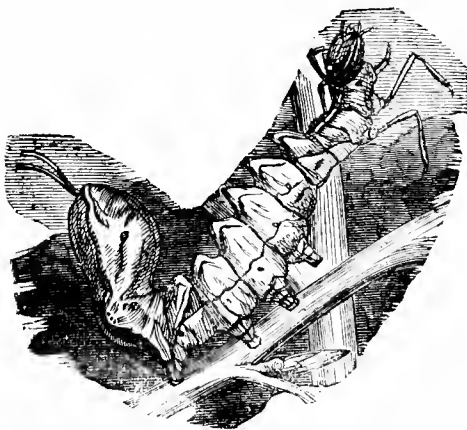
Seeing how hard is the cocoon, it is a matter of wonder that the moth should ever be able to force its way through the walls. This, however, it does in a mode which has not been satisfactorily explained, and contrives to creep through a hole which scarcely seems capable of permitting the passage of an insect half the size of the Puss Moth. These remarkable cocoons may be found upon the trunks of willow-trees, seldom less than two feet from the ground or more than four. The Moth appears towards the end of spring and beginning of summer.

Another Moth of this genus is the SALLOW KITTEN (*Dicranura furcula*), a figure of which is seen on Plate VII. fig. 2. This Moth is called the Kitten, because it is so much smaller than the Puss. As its popular name implies, it feeds upon the various sallow when in the larval state. The caterpillar is much like that of the Puss Moth, but very much smaller and rather differently coloured. It follows the example of the Puss larva in spinning a cocoon on the bark of the tree upon which it feeds, but, instead of making a projecting cocoon, it prefers to find a crevice in the bark into which it can creep and fill up the crevice nearly level with the rest of the bark, so that the cocoon is even more

difficult of discovery than that of the Puss Moth.

Two other species of Kitten Moth are known, the Poplar Kitten and the Alder Kitten. They all appear at the beginning of summer.

Our next insect, though its appearance has nothing remarkable about it in the perfect state, is, when a larva, one of the strangest-looking



Caterpillar of Lobster Moth.

creatures that can be imagined, far surpassing in this respect even the Puss and Kitten larvæ. This is the LOBSTER MOTH (*Stauropus fagi*), which is shown on Plate VII. fig. 7.

The popular name of this insect is derived from the extraordinary shape of the caterpillar, which is fancifully thought to bear some resemblance to a lobster. A figure of this most grotesque larva is here given.

Putting aside the general shape of the larva, the peculiarity which makes it so unlike the generality of caterpillars is the extreme length of the second and third pair of legs, which really look as if they do not belong to it, and have been borrowed from some other insect. Sometimes the caterpillar contracts its body very much more than is shown in the illustration (page 75), and it sits with its head thrown back until it nearly touches the tail, and the three segments below the head pressed closely together. The general colour of this caterpillar is brown, diversified by two dark stripes along the back and a few blackish marks upon the sides.

The caterpillar feeds indifferently upon the oak and birch, and when full-fed spins up several leaves by way of a resting-place, in which it remains until it changes into the perfect state. Even when the leaves fall, no injury is done to the enclosed pupa, the dried leaves fluttering gently to the ground. September is a good month for finding this strange caterpillar.

The colour of the Moth is greyish-brown, blotched and spotted with a darker hue. The antennæ of the male are boldly pectinated for rather more than one-half of their length, the remaining portion being filamentous.

ON Plate VII. fig. 4 is seen a figure of a Moth, which goes by the odd name of the RANNOCH SPRAWLER (*Petasia nubeculosa*), which derives its popular name from the only locality in which it has been found. The figure represents the female insect, the male being smaller, and having the antennæ pectinated.

Although not a brilliant insect, the colours are pleasingly arranged, and consist of various shades of brown, grey, and white.

The caterpillar feeds upon the birch, and then makes its appearance in early spring.

A much more common example of this genus is the only other species known in England,—namely, the SPRAWLER (*Petasia cassinea*).

The popular name of this Moth is, like those of the preceding insects, derived from the larva, which has an odd habit of sprawling about when disturbed, as if it were unable to gain its feet. This larva, although not so grotesque as those of the Puss and Lobster Moths, is yet rather a strange-looking one, the end of the body being pointed and bent suddenly downwards.

It feeds on the oak, and, when full-fed, descends to the earth and burrows into the ground, where it remains until it has attained the perfect state.

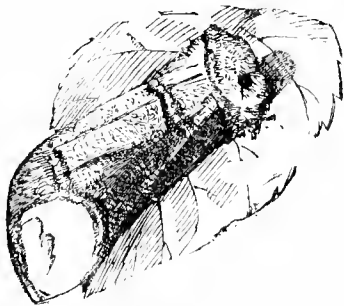
A SMALL but interesting family comes next in order,—namely, the Pygæridæ, of which one example is the common BUFF-TIP MOTH (*Pygæra bucephala*).

A figure of this Moth is given on Plate VII. fig. 10, as it appears with its wings spread. When the wings are closed, it presents an appearance almost as different as does the Lappet Moth, which has been already described. The wings are pressed closely to the body, and almost conceal it, the little head being tucked under the large thorax, and the whole aspect of the Moth very much resembling a piece of brown, withered stick. A figure of the Moth



at rest is here given, so that the reader may compare it with that of the flying Moth on Plate VII.

The popular name of the Moth is given to it on account of the buff-coloured patch at the tips of the upper wings. The general hue of the wings is grey, and they are covered by several darker hues, one of them separating the buff-coloured patch from the rest of the wing. The lower wings are also grey, but with a yellowish tinge, and the body and thorax are brownish



Buff-tip Moth.

buff. In the male insect the antennæ are pectinated, as seen upon the plate, but in the female they are simply thread-like.

The caterpillar feeds upon many trees, and, in some places where the Moth is plentiful, does much damage to the foliage. These caterpillars are gregarious, always feeding in company, and sometimes travelling in long processions, marshalled as correctly as disciplined troops.

It is rather a pretty and conspicuous caterpillar ; but, owing to its fondness for the upper

branches of trees, is seldom seen until it is full-fed and descends for the purpose of seeking a refuge for its impending change. The most characteristic point about this larva is the series of black, short lines which are drawn along the body, as if with a pen and ruler, and which curiously resemble in their order the arrangement in which the larvæ sometimes march.

About the end of July or beginning of August these caterpillars may be seen by hundreds, crawling rapidly over the hard ground for the purpose of finding a convenient resting-place. At this time of year the caterpillars are quite a nuisance in my own house, which is situated in Kent, crawling in at every open door and window, and especially traversing the porch in such numbers that it is scarcely possible to leave or enter the house without crushing some of them under foot.

The favourite place of refuge is the foot of some tree, but the chrysalis is so hardy that it scarcely stands in need of any hiding-place, spinning no cocoon, and seeking no shelter, but simply casting off its larval skin and appearing in the pupal state. The young entomologist is sure to collect plenty of these chrysalides when he goes hunting for specimens, and to find his boxes filled with Buff-tips where he expects a whole series of different Moths. Practice, however, makes perfect, and a brief experience enables the collector to detect the Buff-tip chrysalis and leave it alone in favour of more valuable specimens.

The name of *bucephala* or bull-headed, is given to this Moth on account of its appearance when at

rest. In this position, the head is almost hidden, and the thorax looks very much as if it were a large "bull"-head, the resemblance being increased by a dark spot on either side, which might be taken for the eye by any one who was inexperienced in entomology.

The three other species of this family are the CHOCOLATE-TIP (*Clostera curtula*), the SCARCE CHOCOLATE-TIP (*Clostera anachoreta*), and the SMALL CHOCOLATE-TIP (*Clostera reclusa*).

THE next family, that of the Notodontidæ, contains a very few genera, but one of them, the typical genus, embraces some twelve species. A good, though not very common example of this genus, is seen on Plate VII. fig. 6. This is the WHITE PROMINENT (*Notodonta bicolor*), sometimes called the Orange V Moth, on account of its rather peculiar marking. The figure is a trifle smaller than the generality of specimens.

The colour of all the wings is white, but the upper pair have a double series of blackish dots extending nearly across the wings, and an orange mark looking something like a roughly made V or Y. Even the head, thorax, and body are white, or whitish grey. This Moth appears in June.

We must not pass without notice the PEBBLE PROMINENT (*Notodonta ziczac*), because it is the species which has earned for the whole genus the name of Notodonta, or Tooth-back.

The colours of the perfect insect are in no way remarkable, being nothing more than various shades of brown.

The caterpillar, however, is a most extraordinary

creature. The head is very large in proportion to the general size ; and on the sixth, seventh, and twelfth segments there is a bold hump, that of the sixth segment, which occupies about the middle of its body, being sharp, curved, and pointed backwards, a peculiarity which has given the name of *Notodonta* to the whole genus. When this caterpillar is at rest, it has a most eccentric appearance. It grasps with its claspers the object on which it sits, and turns both its tail and head upwards, so that the sharply humped segments and the large head present a general effect which is well defined by the word zigzag.

This remarkable larva may be found towards the middle and end of autumn upon the poplar and sallow, and can best be taken by beating the branches. It is impossible to mistake this for any other larva, although its colour is but different shades of yellowish brown. When full-fed it descends to the ground, and spins a cocoon upon the surface of the earth, emerging about May or June. It is tolerably plentiful, and can be easiest obtained by taking the caterpillars and rearing them.

## CHAPTER IV.

### NOCTUAS.

WE now come to a very large and most important section of Moths, so large indeed that it alone comprises five times as many species of British Moths as there are of British butterflies. Some of the Noctuas are conspicuous insects, and can be easily identified ; but the greater number are so obscure in their markings, and so destitute of characteristic points of difference, that a young entomologist is often tempted to give up the whole business in despair.

In fact, the Noctuas are among Moths what the ichneumons are among hymenoptera, and the brachelytræ among beetles—enough to break a man's heart.

Sometimes the industrious collector finds some larvæ totally different in shape, colour, and food, and evidently belonging to distinct species. He rears them carefully, and then, when they appear in the perfect form, he finds himself the happy possessor of a number of Moths between which the closest inspection can detect no characteristic sufficiently distinctive to

warrant him in deciding upon the particular species.

Totally vanquished, he puts his specimens in a box, and starts off to some standard collection, feeling sure that he will return in a short time with every specimen properly labelled. He goes to the cabinets, and takes out a drawer of Noctuas, every one of which looks exactly like all the others, and to all appearance will do equally well for identification with the specimens in his box. A second, third, and fourth drawer are examined with precisely the same results, and, unless some experienced entomologist be at hand to explain, the young investigator returns as wise as he went—perhaps a trifle wiser, as he has learned to some extent his own ignorance.

I narrate my own experience. Numbers of Noctuas looked as like each other as the individual sheep of a flock, and it was some time before I could understand that the eye of an entomologist could be trained as well as that of a shepherd, and that both the one and the other would plainly see distinctive marks which were absolutely invisible to the untrained eye. The traveller into distant lands often makes the same remark, and, when, he finds himself among black, or even dark-skinned men, he finds them all alike. He has to dwell among them for some time before he discovers the points of difference, and then he wonders how he could ever have confounded together faces so really dissimilar.

So it is with the Noctuas. At first, the young observer is totally bewildered by the similarity between the multitude of specimens which he is sure to find, and it is not until his

eye has been trained by careful practice that he is able to detect the characteristics which distinguish one species from another. To this general rule there are exceptions, some of the Noctuas being splendidly and boldly coloured, but in the majority of cases the hues are nothing but various tints of brown.

Our first example of the Noctuas is the pretty PEACH-BLOSSOM MOTH (*Thyatira batis*), this rather poetical and very appropriate name being given



Peach Blossom Moth.

to it on account of the colours of the wings, which bear some resemblance to the delicate rose and white of the peach blossom. A figure of this Moth is given on Plate VIII. fig. 3, and another is seen in the above illustration.

The ground colour of the upper wings is brownish, with a wash of green, and the boldly marked spots are rosy pink in the centre, and white at the circumference. The lower wings are much paler brown than the upper pair, and have none of the beautiful rose pink. The antennæ

of the male are slightly pectinated, while those of the female are simple.

The larva of the Peach-blossom Moth feeds on the blackberry, and may be recognized by the slightly velvety body and the humps which appear in several of the segments. That in the third segment projects forward and almost covers the second segment like a hood. The two next segments are simple, but the four next are humped. The general colour of this caterpillar is warm brown, generally mottled with a lighter hue. The Moth appears in the early summer.

ON Plate VIII. fig. 1, is shown a pretty Moth, called popularly the SCARCE MARVEIL-DU-JOUR (*Diphthera Orion*). The figure represents a female specimen, the antennæ of the male being moderately pectinated.

There is no difficulty in distinguishing this beautiful and conspicuous Moth from any other of the Noctuas; but unfortunately it is not so common as might be wished, and a really fine specimen is somewhat of a treasure.

The colour of the upper wings is bright green, barred transversely with black, and longitudinally with white, the whole arrangement of colour being not only striking, but very uncommon among British lepidoptera. The wings are edged with black and white spots. The lower wings are blackish.

The caterpillar of this beautiful Moth feeds on birch and oak, and Mr. Crewe thinks that it feeds alternately upon these trees. Mr. Newman is of opinion that there are really two species of Moth confounded together under one common



name, and that to this fact may be attributed the differences which have been noticed between various specimens of the moth and the larva.

When the caterpillar is full-fed, it makes itself a cocoon with fragments of bark, and the Moth appears about the beginning of summer.

A REALLY remarkable insect is shown on Plate VIII. fig. 2. This is the LARGE WAINSCOT MOTH (*Calamia lutosa*). There is nothing very striking in the appearance of the Moth, the colour of which is a brown something like that of old wainscoting, relieved by a few black spots. This colour, which varies much in point of depth, only belongs to the upper wings, the lower pair being white, sometimes marked with a few brown spots. The body is of the same hue as the lower wings.

The chief interest of this insect lies in its mode of life as a caterpillar.

As soon as it is hatched from the egg, which has been attached by the parent insect to the stem of a reed, it gnaws through the bark, works its way into the centre of the reed, and burrows downwards. When it is about to change into the pupal state, it makes its way upwards again, and prepares the passage by which it will escape when it becomes a Moth. For this purpose it begins to gnaw its way out of the reed, and cuts a circular hole large enough to serve as a passage for the Moth. It does not, however, cut completely through the stem, but leaves a very thin layer of epidermis, so that there is no aperture in the reed to betray its retreat to an enemy, while the delicate epidermis

yields easily to the efforts of the Moth when it comes to push its way into the open air.

Several Moths act in this curious manner. THE BULRUSH MOTH, for example (*Nonagria typhæ*), acts in precisely the same manner with the reed-mace or cat's-tail (*Typha latifolia*), and the BREEZE-FLY CLEARWING (*Aegeria asiliformis*) spends its larval life in the interior of poplar branches, and prepares its exit by eating a hole which almost but not quite penetrates through the outer layer of bark. This insect is allied to the Hornet Moth, described in page 15.

The generic name of *Calamia* is derived from the Latin word *calamus*, which signifies a reed.

WE now come to some pretty Moths, which go by the popular name of Gothics, because the nervures of the wings are very distinctly marked, and look something like the tracery of Gothic windows. These nervures are not marked with sufficient distinctness in the figure on Plate VIII. fig. 7, which represents the FEATHERED GOTHIC (*Heliophobus popularis*).

The general colour of the upper wings is brown, and there is a very distinct pale spot in the discoidal cell. The nervures are of a similar pale hue, and some dark, irregular bands run transversely across the wings. The colour of the lower wings is simply pale brown.

The larva passes its time mostly underground, whence the generic name of *Heliophobus*, or Sun-fearing, and it does not emerge from the earth until it has assumed the perfect condition. The Moth appears in the autumn.

Another of the Gothics—the BORDERED GOTHIC (*Neuria Saponariæ*)—is even a prettier insect than the preceding species, and has, in addition to the white nervures, four delicate pale lines across the wings transversely. The generic name is taken from the Greek word signifying a nerve, and is given to the insect on account of the conspicuous nervures of the wing.

Nearly allied to the Gothics is the ANTLER MOTH (*Charæas graminis*), a figure of which is given in the illustration below.

This Moth is more plentiful than welcome, as it causes great damage to agriculture while in its larval state. Of this damage we will presently treat.



Antler Moth.

Like the majority of the Noctuæ, the Antler Moth is soberly clothed in different shades of brown, the arrangement of which can be seen by reference to the figure. It appears at the beginning of autumn, and may be found in any number on grass lands.

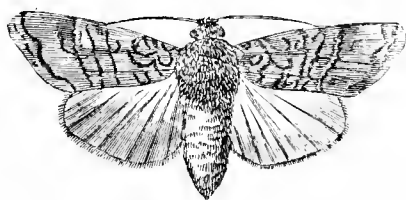
The larva of this Moth is one of the worst insect enemies with which the agriculturist has to contend. It feeds on the roots of grasses, and remains during the whole of its earlier stages

buried beneath the soil, so that its ravages can only be detected too late to save the plant which it has killed.

Even in this country, the Antler caterpillar has often destroyed whole acres of pasture-land, and is quite as destructive in this way as the cockchafer or the daddy-long-legs, while on the Continent its approach is looked upon with absolute terror, the caterpillar army advancing across the fields as if under discipline, and, though hidden from view, destroying all the grass by devouring the roots. In some places it has absolutely destroyed the grass crops, while in none does it appear without doing great damage.

The caterpillar is rather smooth, and of a dull grey colour, harmonizing almost perfectly with the soil in which it lives, and from which it never emerges until it has passed through the larval and pupal stages of existence.

Next we come to the genus *Mamestra*, which we have an example in the CABBAGE



Cabbage Moth.

MOTH (*Mamestra brassicae*), a figure of which is here given.

The popular name of this destructive Moth is

given to it on account of its habit of feeding on the cabbage when in its larval state. This is the unpleasant caterpillar which sometimes is served up at table by careless cooks, inasmuch as it eats its way into the very centre of the vegetable, where it sometimes is so snugly hidden that it cannot be ejected by the salt and water into which the cabbage is plunged before being boiled. It must not be confounded with the caterpillar of the white cabbage butterfly. Indeed, the cook is sometimes scarcely to blame, for these caterpillars are so numerous, that the total ejection of them all, and the cleansing of the leaves from their refuse, is almost an impossibility.

When the caterpillar is full-fed, it descends to the ground, in which it burrows, and there remains until it assumes the perfect state in the ensuing summer.

The colour of the upper wings is very dark brown, with a decided tinge of grey, and diversified with a number of transverse dark marks distributed rather singularly over its surface.

Though, as its name implies, the principal food of this insect is the cabbage, it is rather a general feeder, and may be found in the larval state in almost every garden herb.

OF the typical family Noctuidæ, we shall take several examples, the first of which is the ARCHER'S DART (*Agrotis valligera*), a figure of which is given on Plate VIII. fig. 6.

The colour of this Moth is exceedingly variable, but is generally brown of different hues, the dis-

position of which can be learned by reference to the figure. The hind-wings are paler in the male than in the female, and the antennæ are more pectinated.

The larva feeds upon the roots of grasses, and the Moth appears in the height of summer. The genus of which this species is an example is a very large one, containing more than twenty species, among which may be mentioned the destructive TURNIP MOTH (*Agrotis segetum*), which does so much damage to the turnip while it is in its larval state. This caterpillar is one of the worst enemies which the turnip has, keeping itself hidden beneath the earth, and burrowing deeply into the bulb of the plant. It also attacks many other vegetables, such, for example, as carrots, mangold-wurzel, and even the radish; while, in default of these its favourite food, it makes great havoc even among garden flowers.

There is a very admirable article on this insect in Mr. Newman's "Illustrated Natural History of British Moths," which is too long to be inserted entire, and too full of matter for condensation.

OF the handsome and conspicuous Underwing Moths we take two examples, the first of which is the BROAD-BORDERED YELLOW UNDERWING (*Triphaena fimbria*), a figure of which is seen on Plate VIII. fig. 8. In these Moths there is much more colour than is usual among the Noctuæ, and, contrary to the general rule, the brightest colours are in the hind pair of wings. The reason for this arrangement is

obvious. When the Moth is at rest, the upper pair of wings close over the lower and completely hide them, so that, in spite of the bright colouring, the insect looks very sombre, and, when resting upon the trunk of a tree or similar object, is scarcely to be detected, even by practised eyes.

The colour of the upper wings is brown, rather variable in different specimens, some having a decidedly green tinge, while the majority are a warm, but not very dark brown. A few pale bands and marks occur on the wings, as may be seen by reference to the figure. At the base of the hind-wings is a large patch of bright orange, then comes a broad belt of deep black, and on the hind margin is a narrow band of the same orange as that of the base. The abdomen is also orange.

The caterpillar of this Moth, though tolerably common, is never seen except by those who are skilled in this department of natural history. It feeds on several trees, of which the birch is the favourite, but spends the whole of the day beneath the ground, and only comes out after dark, when it ascends the tree and feeds on the leaves. The colour of this larva is pale brown. The Moth appears during the early summer, and remains visible for at least three months.

On Plate VIII. fig. 5, is shown the second species of this genus, the LARGE YELLOW UNDER-WING (*Triphæna Pronuba*).

This is also rather a variable insect in point of colour, the fore-wings being brown, sometimes lighter and sometimes darker, diversified with markings almost as variable in form as they are

in colour. The hind-wings are orange yellow, and have a moderately broad black band running near the hind margin, which is edged with a narrow stripe of yellow.

The larva feeds on many vegetables, and is sometimes very destructive in gardens, owing to its habit of eating its way into the stem, or sometimes into the very heart of the plant, and remaining underground during the day, so that it cannot readily be detected. When full-fed, it again burrows into the ground, makes a rough kind of cell of earth, and then undergoes its change into the pupa, the Moth appearing in early summer. Owing to these habits of concealment, the larva, though more common than gardeners like, is very seldom seen.

The typical genus of this large family is represented here by the DOUBLE-SPOTTED SQUARE SPOT (*Noctua triangulum*), a figure of which is given on Plate IX. fig. 2.

This insect derives its popular name from the markings upon the upper wings, on each of which occurs a nearly square dark spot, accompanied by another of smaller size and not so well defined. There is another dark spot near the tip of each wing. The ground colour of these wings is greyish brown, and the hue of the hind-wings is also brown, but paler, and almost without marking.

The caterpillar feeds on the night-shade, and is coloured with much the same hue as the upper wings of the perfect insect. The Moth appears at the end of spring or beginning of summer, and is tolerably common in most parts of England. The genus is a very large one, twenty British species being included in it.



THE next family, that of the Orthosidæ, contains a great number of Moths, our first specimen of which is the PINE BEAUTY (*Trachea Pini-perda*), a figure of which is given on Plate IX. fig. 3.

This is a very pretty Moth, the upper wings being orange-brown, variegated with bold markings of dark brown and greyish white, the shape and arrangement of which can be seen by reference to the figure. The lower wings are pale grey brown, and the thorax is coloured much like the upper wings.

The larva of this Moth feeds on the fir, and may be shaken from the tree by tapping the branches. When full-fed it spins a slight cocoon in a crevice of the bark, and there remains until it changes into a moth, which appears about the middle of spring. After it issues from the cocoon, it is fond of sitting motionless upon the trunk of the tree, from which it is not easily distinguished, the hues and markings of the upper wing harmonizing admirably with the warm and varied colours of the bark.

Omitting, for want of space, several genera, we come to the Genus *Dasycampa*, of which only one species is known in England. This is the DOTTED CHESTNUT (*Dasycampa rubiginea*), a rather pretty Moth, that derives its popular name from the colour and markings of the upper wings. A figure of this Moth is given on Plate IX. fig. 1.

It is here given, though it is not a common Moth, because it is the only British example of the genus, and therefore is an important link in

the chain. Moreover, now that its haunts have been discovered, it is not nearly so rare as it was a few years ago, as indeed is the case with many insects which in former days were among the rarest of an entomologist's treasures, but are now comparatively plentiful.

The ground hue of the upper wings is chestnut, slightly tinged with yellow, and diversified with some dark brown patches and a number of small black dots, scattered profusely over the surface. The lower wings are ashen grey, edged with a pinkish fringe, and the body and thorax take the colour of their two pairs of wings.

The larva of the Dotted Chestnut feeds on various plants and trees, such as the dandelion, the apple, and the yew, and when full-fed descends to the ground, where it spins a cocoon, and therein waits until it emerges in the perfect state. It is said to be double-brooded, one brood occurring in October and the other in April, but I never took either the larva or the perfect insect.

Of the Sallow Moths we take two examples, the first of which is the SALLOW MOTH (*Xanthia ceraso*), a figure of which is seen on Plate IX. fig. 8.

This Moth is variable in colour, but the upper wings are usually of a darkish yellow, on which are a number of deep brown markings, without any particular shape or apparent arrangement. The colour is sometimes much paler, both in the ground tint and the markings, and it is this variety which is shown in the figure. The lower wings are greyish white. When the Moth is at rest, the wings are closed over the middle of the body, and slope downwards on either side, in roof fashion.

In common with all the genus, the caterpillar feeds on the willow, and may be seen upon the catkins. It is brown, with a sort of blue wash, and has several pale lines running along the body. The Moth appears about the middle of autumn, and is tolerably plentiful.

Another species of this genus, the PINK-BARRED SALLOW (*Xanthia silago*), is seen on Plate VIII. fig. 4.

This is a much handsomer insect than the preceding species. The popular name, however, is scarcely deserved, as the so-called pink bars are rust-red rather than pink. The ground colour of the upper wings is reddish yellow, and the markings, together with the incomplete bars that cross the wings, are rust-red with a wash of violet. The lower wings are almost uniformly pale grey, with a very slight tinge of yellow.

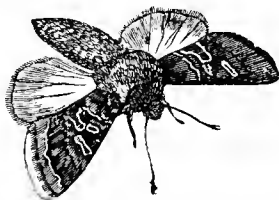
The larva feeds on the willow, and the Moth appears about the middle of autumn. It is a tolerably common species, its numbers depending necessarily on the locality, inasmuch as the willow prefers moist and low-lying grounds.

WE now pass to another family, namely, the Hadenidæ, one or two examples of which will be given. The first is the LYCHNIS (*Dianthæcia capsicola*), so called on account of its food when in the larval state.

The colours of this Moth are very simple, the ground tint being rather dark brown, upon which are a number of paler marks, the shape and arrangement of which can be seen by reference to the accompanying figure. The most characteristic of these marks is the pale belt,

which runs parallel with the hind margin of the wings, and a greyish white nervure that runs through the middle of the wing. The hind-wings are rather dark grey. The two sexes of this Moth are easily distinguished by the shape of the abdomen, which in the male is comparatively short, and tipped with a tuft of feathery plumes, while in the female it is long, conical, and sharply pointed.

The caterpillar may be found upon the White Campion, sometimes called the Corn Lychnis (*Lychnis vespertina*), feeding upon the seeds of the plant. It is rather a pretty caterpillar, the colour being brown, and each segment being



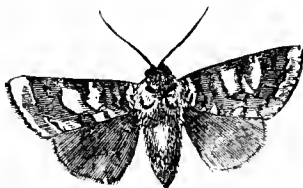
The Lychnis.

marked with a greyish chevron and a bar and two round dots of the same colour. The Moth appears at the beginning of August.

Another species of this genus is the MARBLED CORONET (*Dianthæcia conspersa*), an insect which is more conspicuous in its colouring than the preceding species. The ground hue of the forewings is nearly black, and the markings, which are somewhat variable, are of a soft white. Perhaps the most constant and conspicuous of these marks is a narrow and slightly waved

line, which runs nearly parallel to and not far from the hind margin, and widening into a white patch near the corner of the wing.

Like the larva of the preceding insect, the caterpillar feeds on a *lychnis*, but prefers another species, the common Ragged Robin (*Lychnis flos-cuculi*), sometimes called the Meadow Lych-



Marbled Coronet.

*nis*. When full-fed, it burrows slightly beneath the ground, spinning for itself a silken cocoon mixed with earth, and changing into a chrysalis which is remarkable for the two sharp points which project at the end of the body. The Moth makes its appearance at the beginning of summer.

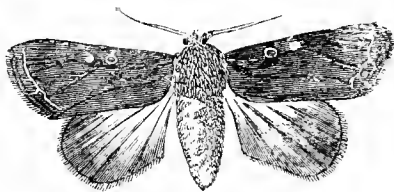
On Plate IX. fig. 5, may be seen a rather handsome Moth, popularly called the GREAT ANGLE SHADES or FLAME BROCADE (*Trigonophora*, or *Phlogophora*, *empyrea*). This insect has hitherto been placed in the same genus with the common ANGLE SHADES MOTH (*Phlogophora meticulosa*), but Mr. Newman gives the following reason for separating the two insects: "I can find no affinity between this species and *Meticulosa*, with which it has been associated; both the caterpillar and perfect insect agree better with the genus *Hadena*; when placed between

*Meticulosa* and *Lucipara* (the Small Angle Shades), it seems to discover a very natural alliance."

The ground colour of the fore-wings is dark brown, with a purplish wash on the darker portions shown in the illustration. The light-coloured markings are nearly white. The hind-wings are greyish black, but become pale towards their bases.

The caterpillar feeds on the common pilewort, or lesser celandine (*Ficaria verna*); and when full-fed, it descends to the ground and spins a cocoon of silk mixed with earth. The chrysalis has two slight spines on the end of the tail. The Moth appears in the middle of autumn, and, in those places which it frequents, is plentiful. It seems, however, to be a local insect.

Of the large genus *Hadena*, which includes some seventeen species, we shall take two examples. The first is the BRIGHT-LINE BROWN-EYE (*Hadena oleracea*), a figure of which is given in the accompanying illustration.



Bright-line Brown-eye.

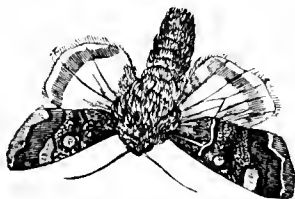
This Moth derives its popular name from the brilliantly white line which runs nearly parallel to the hind margin of the upper wings,

and in the middle takes a bold zigzag turn. The ground colour of these wings is rust-brown, and upon them are two rather indistinct greyish marks, which are shown in the illustration.

The caterpillar of this Moth feeds upon a variety of plants, both in the wild and cultivated state. In the fields it may be found upon the elm, the nettle, the dock, and other plants, while in the gardens it takes a fancy to lettuces, cabbages, and broccoli, especially preferring the last-mentioned vegetable, and often does great damage among them, concealing itself just below the surface of the ground. On account of this predilection for garden herbs, it is sometimes called the POT-HERB MOTH.

The perfect insect appears at the beginning of summer.

Another species of this genus, the BROOM MOTH (*Hadena pisi*), is shown in the accompanying illustration



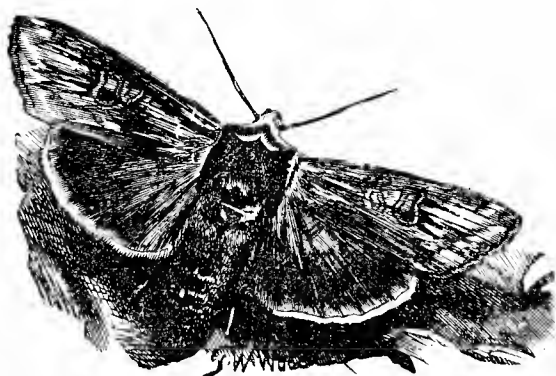
Broom Moth.

This Moth derives its name from the fact that the caterpillar generally lives on the broom, though it also feeds on other papilionaceous plants, such as the pea and the vetch, and so does much harm in the field and garden. It also feeds on the common bracken fern.

The ground colour of the upper wings is chestnut brown, but both this hue and those of the lighter markings are rather variable. On reference to the illustration, the reader will see that almost parallel with the hind margin of the upper wings runs a jagged, light-coloured streak. The colour of this streak varies from white to yellow. The colour of the hind-wings is paler than that of the upper pair, and they become nearly grey towards the base.

The larva is a very pretty one, being striped with various shades of green, black, white, and yellow. The Moth appears about the beginning of summer.

Of the next family, the Xylinidæ, we shall take one or two examples.



Sword-grass Moth.

First comes the SWORD-GRASS MOTH (*Calocam exoleta*), a figure of which, together with one of the beautiful larva, is here given.



The colouring of the Moth is not easily described, but a good idea of it may be gained by reference to the illustration. The upper wings are grey with a very slight tinge of blue, and upon them are a number of dark streaks, indistinctly defined. The hind-wings are brown-grey with a whitish grey fringe.

The larva of this insect is so handsome that it has earned for the genus the name of *Calocampa*—beautiful caterpillar. The ground colour



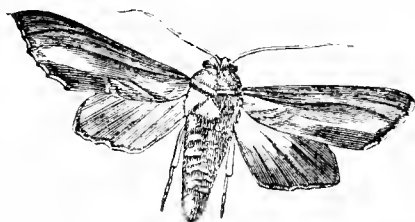
Caterpillar of the Sword-grass Moth.

is green, sometimes rather dull, but often very brilliant, and upon it are drawn stripes of white and scarlet, while the 3-like mark on each segment is pure white edged with deep black. It feeds upon many plants, and the perfect Moth appears towards the end of autumn.

Our next example of this family is the MULLEIN MOTH (*Cucullia verbasci*), so called from the principal food of the larva, which is the great mullein (*Verbascum thrapus*).

Although the tints of this Moth are very sober, it is yet a pretty insect, owing to the

delicate shades of brown and grey and the mode in which they are arranged. The two most conspicuous marks in this insect are the boldly scalloped hind margins of the wings, and the two whitish crescents which cross the middle of the inner margin. The hind-wings are greyish brown, becoming paler towards the base



Mullein Moth.

The caterpillar feeds upon several plants, but is generally found on the great mullein. It is rather a brilliant caterpillar, the colour being light green, with a stripe of bright yellow on either side, and a great number of black and very variable marks. The Moth appears about the middle of spring, and is very common.

THE family of the Plusidæ will be represented in this book by several examples, two of which belong to the typical genus.

A figure of the BURNISHED BRASS MOTH (*Plusia chrysitis*) is shown on Plate IX. fig. 4.

This pretty and well-known Moth derives its popular name from the colour of the upper wings, which are of a shining gold-green, with a metallic look about them. There are one or two

brown patches upon the wings, but their prevailing hue is the brilliant metallic colour already described. The hind-wings are pale brown, without any metallic lustre.

The caterpillar feeds on the dead nettle and other plants, and is rather prettily coloured, the body being green, diversified with a number of white marks and segments, and a row of black dots along the sides.

This is one of the double-brooded Moths, appearing at the end of spring and the beginning of autumn.

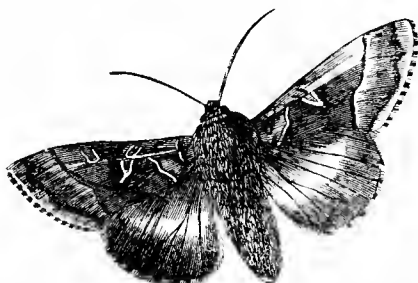
Our next example is the SILVER Y MOTH (*Plusia gamma*), so called on account of the peculiar white mark on the upper wings, which looks much like the English letter Y or the Greek letter  $\gamma$ . Several of the Moths belonging to this genus are remarkable for the letter-like marks upon the upper wings. There is, for example, the *Plusia iota*, in which the burnished gold mark is something like the written letter i, with its dot. There is also the *Plusia Nu*, in which the mark is like the letter n written in silver upon the dull grey of the wing, and the *Plusia interrogationis*, in which the silvery mark, with its neighbouring dot, resembles in some specimens a note of interrogation.

The colour of the upper wings is shining grey, covered irregularly with brown. A rather large patch occupies the middle of the wing, and upon this patch is placed, as if for contrast, the gamma-like mark which looks as if it were made of burnished silver leaf. In fact, with all these Moths which exhibit the letter-like marking, the metallic glitter exists as in the Burnished Brass

Moth, but only to a very limited extent, instead of occupying the greater part of the wing as in that insect.

The hind-wings are rather pale grey, but a broad dark band extends round the hind margin. It is a day-flier and very active Moth, dashing about with such rapidity, that it is not easily captured, even by a practised wielder of the net.

The caterpillar feeds on various herbs, and is sometimes terribly destructive in gardens—more



Silver Y Moth.

so on the Continent than in England. In some parts of France it has destroyed whole crops at a time, and its ravages were the more destructive because the peasantry, with their usual superstitious ignorance, thought that the creature was venomous, and so refused to eat any plant that one of the caterpillars had touched.

This very common Moth appears throughout the whole of the summer, and may be seen on the wing far into the autumn, flying about the flowers of the season as merrily as in the beginning of summer.

THE insect which is figured on Plate X. fig. 4, is the only British example of the family Toxocampidæ. Its popular name is the BLACK NECK MOTH, and the scientific title is *Toxocampa pastinum*.

The colour of the upper wings is very pale brown, across which are drawn a multitude of delicate black lines not reaching completely across the wing. The dots which are seen on the wings are black. The name of Black Neck is given to this insect in consequence of a very dark black-brown band that is drawn between the head and the neck; another similar band marks the junction of the thorax and abdomen. The caterpillar feeds on the vetch, and is rather remarkable in appearance, its long and slender body having gained for the insect the generic name of Toxocampa, or Bow-caterpillar. Seven narrow stripes of yellow and grey run along the upper surface, and the lower surface is very dark blackish brown. The Moth appears in the early summer.

WE now come to the family Catocalidæ, which includes the magnificent genus of which we shall take two examples.

On Plate IX. fig. 7, is a figure of the splendid CLIFDEN NONPAREIL (*Catocala fraxini*), an insect which derives its popular name from the locality in which the first recorded specimen was taken. Sombre as are its colours, it is a grand-moth, measuring sometimes more than four inches across the wings.

It is rather remarkable that in all the Moths belonging to this group, the colours are arranged

differently to the usual plan, the upper pair being sombre, and the lower pair brightly coloured; so that when the insect sits with closed wings, the beautiful hues of the underwings are completely concealed. The generic name *Catocala* is composed of two words, the one signifying below or beneath, and the other beauty, and is given to the insect in consequence of this peculiarity.

In this species, the upper wings are soft, cool grey, beautifully marbled with various shades of brown. The hind-wings are delicate lilac, with a large patch of deep black, a broad band of black running parallel with the hind margin, and a rather narrow band of white forming the edge of the anterior margin itself.

This is not at all a common Moth, but is so characteristic that it could not well be omitted; and it is not impossible that even yet it may become comparatively plentiful, as has been the case with many insects which were once extremely rare, but are now held as common. Mr. Newman gives the young collector a valuable hint respecting this insect. "Some supposed English specimens are sold by dealers at a very high price, a fact that holds out a perpetual premium to fraud. I strongly recommend entomologists never to buy an English specimen. If they desire to place a specimen of this beautiful insect in their cabinets, let them give a few pence for a French or German specimen, and, *having labelled it with care*, place it in its appointed station. It is an evidence of folly to give two or three pounds for an insect just because it is supposed to be taken on the Eng-

lish instead of the French side of the Channel. This practice, however, prevails to so great an extent as to render it next to impossible to unravel the history of every reputed British specimen."

I might add to this advice a strong recommendation never to buy an insect on any pretext whatever. The principal charm of forming a collection of insects lies in the hunting and rearing them, and watching their habits, before they are consigned to the cabinet; and those who fill their cabinets with purchased specimens not only lose all the pleasure attending the right pursuit of entomology, and deprive themselves of the sound knowledge which they ought to have gained, but do their best, however unwittingly, to degrade a most important branch of Natural History into a mere itch of collecting for collecting's sake.

Our next example of this fine genus is the DARK CRIMSON UNDERWING (*Catocala sponsa*), a figure of which is given on Plate IX. fig. 6.

The colours of this splendid insect are singularly beautiful, even the comparatively sombre hues of the upper wings being so rich in tint, and so beautifully disposed, that they would have caused the insect to rank among our handsomest moths, even had the hues of the lower wings been of the same hues.

The ground-colour of the upper wings is soft, creamy grey, in many specimens having a tinge of yellow in it—just that tint which belongs to the purest butter. The whole of the surface is covered with marbled patterns of dark brown,

the general arrangement of which can be seen by reference to the figure, without any tedious detailed description. The hind-wings are deep crimson, with a jagged black band running across their centre, and another broad band passing round the hind margin.

The caterpillar feeds on the oak, and the perfect insect appears about the middle of summer.

There is another insect that somewhat resembles the preceding species. This is the RED UNDERWING (*Catocala nupta*). It is generally larger than the Dark Crimson Underwing, but is scarcely so handsome an insect, the hind-wings being red instead of crimson.

The caterpillar feeds on the willow, and the Moth appears in autumn. It is fond of settling on the branch of the tree on which it is fed, and when it is at rest the scarlet of the lower wings is entirely hidden by the mottled grey-brown of the upper pair, and the insect harmonizes so completely with the colour of the bark, that, large as it is, very few persons could detect it. I have frequently seen these Moths resting on the trunks of the willows that edge the river Cherwell, near Oxford, and on more than one occasion have proved that even when the Moth was pointed out to my companions, they could not see it.

THE family of the Ophiuridæ is represented by the only British species, the LUNAR DOUBLE STRIPE (*Ophiodes lunaris*), a figure of which is given on Plate X. fig. 4.

The colour of the upper wings is pale brown, and they are crossed by two narrow stripes of a lighter hue, and by a waved dark line near the



hind margin. The hind-wings are of the same colour, but not quite so dark. The caterpillar feeds on the oak, and is so long and snaky that it has gained for the genus the name of *Ophiodes* or serpent-like. The Moth appears about May and may be looked upon as one of the entomologist's treasures, soberly coloured though it may be.

## CHAPTER V.

DELTOIDES, AVENTIÆ, PYRALIDES, CRAMBITES,  
TORTRICES, TINEÆ, AND PTEROPHORI.

WE now leave the Noctuas, and come to a series of groups of a totally different character. As a general rule, the Noctuas are tolerably large, and some of them, such as the Clifden Nonpareil, take rank among the giants of British Moths. In the group which we are about to examine, the reverse is the case, none of them being large, and many of them so small that a magnifying glass is needed before the markings of their wings can be satisfactorily made out. Their number is enormous, and many of them resemble each other so closely, that to distinguish them is a business of the greatest difficulty. I have therefore selected some of the largest and most conspicuous insects as examples of these groups.

OF the small group of Deltoides, we take, as an example, the SNOUT (*Hypena proboscidalis*), which is drawn on Plate X. fig. 1. There are three species of this genus, but that which is given in the plate may be described as the typical species, not only of the family Hypenidæ, but of

the whole group. All the Snout Moths are distinguished by the extreme length of the palpi, which project far in front of the head, and look almost like a forked proboscis.

The colour of the upper wings in this species is yellowish brown, edged with a dark brown band at the hinder margin, and having two stripes of the same colour drawn across the wings. The lower pair are brown, but paler, and almost without markings.

The larva of this species is rather long in proportion to its diameter, and is covered with moderately long and stiff hairs. It feeds upon the common nettle. The perfect insect appears in the summer.

#### AVENTIÆ.

Of the next group, only one species is at present known to inhabit England. This is the BEAUTIFUL HOOK-TIP (*Aventia flexula*), a figure of which is given on Plate X. fig. 3.

This very pretty insect has the basal half of the upper wings pink, and the remainder dark brown, the light streaks which cross the wings being orange. The lower wings are paler than the upper, and are barred with a similar orange to that of the upper pair. One remarkable characteristic of this Moth is the deep scalloping of the hinder margin in the upper wings, which are cut into two distinct hollows, the first being very bold, and the second rather more undulating.

The larva is as curious as the perfect insect, being much smaller at the ends than in the middle, rather flattened, and having a row of

projections above the legs. It is beautifully coloured with orange brown, white, and green, the first-mentioned colour occupying the two extremities. It feeds on the lichen, and when full-fed spins a slight silken cocoon in which it undergoes changes. The perfect insect appears in the beginning of summer.

#### PYRALIDES.

The large group of Pyralides will be represented by several examples, the first of which is the MOTHER OF PEARL (*Botys verticalis*), an insect which may be considered as an excellent type of the entire group. The Moth is represented on Plate X. fig. 5. All these Moths are remarkable from the fact that when at rest their wings form a sort of triangle, of which the apex is at their junction with the thorax. The Moths of the genus *Botys* have the abdomen rather larger than the wings, and decidedly slender.

Although the colours of this Moth are very simple, being nothing more than lighter or darker shades of brown, the insect is a very pretty one, on account of the peculiar gloss of its wings, which look almost as if they were made of mother-of-pearl. The dark brown marks upon the wings are more distinct than is the case with the other moths of this genus.

The larvæ are slender, but are thicker in the middle than at the two extremities. When full-fed, they spin for themselves a silken cocoon among leaves.

Ten species of this genus are known to exist in England, and all of them have received the name of Pearl Moths, from the peculiar gloss of

the wings. Another species, the LONG-WINGED PEARL (*Botys lancealis*), is shown on Plate X. fig. 17.

As may be seen by reference to the illustration, the wings of this species, though quite as long as those of the preceding species, are much narrower, so as to make them appear longer than is really the case. No other species has this peculiar shape of wing, so that the species can be at once recognized. This is a very pretty Moth, the lighter parts of the wings being pearly yellow, and the darker composed of several shades of brown.

Another insect of this family is the GARDEN CHINA-MARK (*Ebulea* or *Phyctænia sambucalis*), which is shown on Plate X. fig. 7

Although the colours of this insect are dark, it is a very pretty little moth. The ground-colour of the wings is blackish brown, with a few blotches of yellow or brown, and the wings edged with the same lighter hue. The bold markings shown in the figure are greyish white.

As may be inferred from the specific name *sambucalis*, the caterpillar of this Moth feeds on the elder. The perfect insect, which is plentiful in all places where elder-trees abound, appears at the beginning of summer.

#### CRAMBITES.

We now pass to another group of Moths.

The reader may perhaps have observed that all the specific names of the Pyralides end in *alis*. This is done in order to show at once to which group the various species belong. Similarly, all the Crambites end in *ellus* or *ella*, all the Tortrices end in *ana*, and the Tineæ invariably end in *ella*.

Our first examples of the Crambites are taken from the typical genus. The first of them is the PEARL VENEER (*Crambus pinetellus*), a figure of which is given on Plate X. fig. 9.

This is a singularly pretty little Moth. The upper wings are rich chrome yellow, with a pearly sort of gloss, from which the insect derives its popular name. In the centre of the wing is a bold white mark, reaching nearly from the hind margin to the base, and interrupted in the middle by a dark brown diagonal bar. The lower wings are pale glossy grey, slightly darker towards the hind margin. In all the Moths of this genus, the palpi are long, and project in a beak-like form.

Another species of this pretty genus, the STREAKED VENEER (*Crambus selasellus*), is shown on Plate X. fig. 8. The Moth derives its popular name from the colour of the upper wings, which are ochreous grey, and have a central white streak which reaches beyond the middle of the wing and then becomes forked. The hind-wings are simply grey.

Immediately beneath the Streaked Veneer is the COMMON VENEER (*Crambus tristellus*); see fig. 11. The projecting palpi are exceedingly conspicuous in this insect, and this species may be considered as the typical insect of the entire group. The upper wings of this Moth are yellowish brown, and the lower wings are pale brown, without the yellow gloss of the upper pair.

At fig. 10 of Plate X. is a Moth in which the palpi are still more elongated than those of the preceding species. This is the GIGANTIC VENEER (*Schænobius gigantellus*), so called on

account of its size, which is much greater than is the case with the generality of these Moths.

The figure represents the female insect, which has the fore-wings pale glossy brown, and the hind-wings pure white. The male insect has both pairs of wings yellow brown, and the upper pair spotted. In some places this Moth is rare, but it may generally be taken on low-lying and marshy grounds, as the caterpillar feeds upon the reed. The Moth appears at the beginning of summer.

#### TORTRICES.

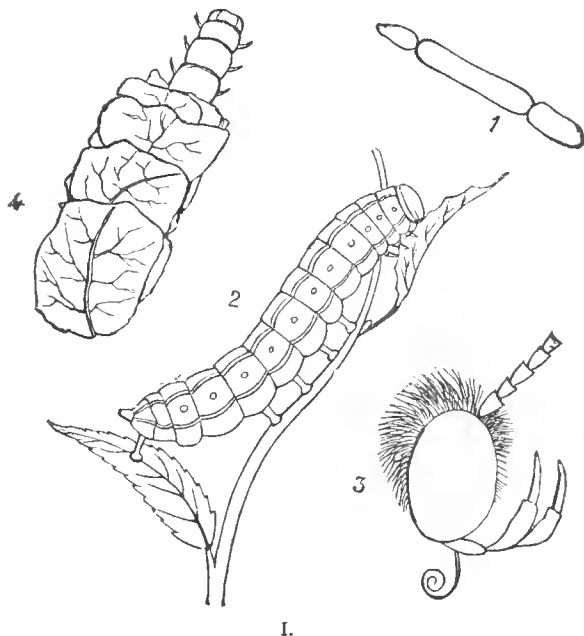
The great group of the Tortrices comes next in order. These insects are called Tortrices or Twisters, on account of the mode in which their larvæ generally feed, rolling up the leaves of various plants, and living within the contorted leaf.

The first example of the Tortrices that we shall take is the LARGE MARBLED TORTRIX (*Sarcotripa revayana*), a figure of which is given on Plate XI. fig. 2.

A glance at the figure will show how appropriate is the popular name of this insect, for it is not only larger than the generality of Tortrices, but the wings are beautifully marbled. Like many of the Tortrices, it is exceedingly variable, at least twelve distinct varieties being known to entomologists. The colours of the upper wings are always different shades of brown intermingled with whitish grey.

The caterpillar of this Moth feeds on the willow and the perfect insect is on the wing throughout the greater part of the summer and autumn.

Next come some examples of the typical genus. On Plate XI. fig. 1, is seen the HAZEL TORTRIX (*Tortrix sorbiana*), an insect which may be considered as the typical species of the whole group. The upper wings are yellowish brown, and the markings are dark brown, while the



lower wings are simply brown. In this, as in nearly all the Tortrices, there is a considerable amount of variation, even among insects that are hatched from the same brood.

The caterpillar of this species feeds chiefly on



the hazel, but is also found upon the oak. As an example of the Tortrix larva, a specimen is shown in the preceding illustration, fig. 2 (page 117). The reader will probably notice at a glance the singular form of the claspers. At fig. 1 is drawn one of the peculiar labial palpi of the perfect insect.

Another species of this genus is extremely common, and is popularly known by the name of the PEA GREEN MOTH (*Tortrix viridana*) on account of its colour. The upper wings are of a beautiful pea-green, the lower pair being pale brown.

The larva of this insect feeds on the oak, and in some years swarms in countless myriads, so that the verdure of the oak-trees is sensibly diminished. At such times, if the branches of the oak be smartly struck, or even if a heavy blow be given to the trunk of the tree, a vast quantity of insect life becomes suddenly discovered. Should the Moths be out, a whole army of them will come fluttering from the foliage, looking exactly as if they had been scraps of green leaves which had suddenly assumed life.

At this time, while the larvæ are still engaged in the business of feeding, thousands of little caterpillars come dropping down from the branches, each hanging by a very slight but very tough silken thread, which they can be induced to lengthen almost to any extent, by simply continuing the blows which first startled them out of their leafy homes.

One of the oddest things connected with this Moth is the fact, that its numbers are greatly decreased by means of a little fly belonging to

the genus *Empis*. This fly possesses a long and sharp proboscis, by means of which it can suck the life-juices out of the Moth. Unlike most insects of prey, it does not only eat its prey while on the wing, but retains it in the



Green Oak Moth.

Oak Moth and *Empis* Fly.

clasp of its long and slender legs while the proboscis is draining the poor little Moth of its blood. I have captured great numbers of the *Empis* while thus engaged, and the above illustration represents the fly as it appears while destroying the Moth.

Still keeping to this genus, we have the CLOUDED TORTRIX (*Tortrix semialbana*), a figure of which is given on Plate XI. fig. 4. The ground colour of the upper wings is pale ochreous yellow, and the dark markings, the form of which can be seen by reference to the plate, are brown, slightly differing in depth in various specimens.

On Plate XI. fig. 7, is a figure of another species of the same family, though not of the same genus. This is the LETTERED TORTRIX (*Leptogramma literana*), so called from the manner in which its upper wings are decorated with marks something like small letters.

The upper pair of wings present a curious roughened appearance which, when examined with a magnifying-glass, is seen to consist of

number of bright but pale grass-green scales, which are elevated above the general surface of the wing. There is a row of tiny white dots upon the hinder margin. Some specimens have a patch of black elevated scales upon the base of the upper wings, and there are few of this very variable insect which are exactly alike in the colour and distribution of the markings. The lower wings are simply pale brown.

A mere glance at the little Moth shown in Plate XI. fig. 9, is sufficient to show one of its principal peculiarities, namely, the deep scalloping in the front edge of the upper wings. In consequence of this characteristic it is called by the appropriate name of NOTCHWING (*Teras caudana*). It is rather variable in colour, but the ground-colour of the upper wings is always brown of some shade or other. In the specimen from which I write this description the wings are pale brown, with an indistinct patch of ochreous yellow in the middle, and the scallops edged with a band of blackish grey.

The larva of this insect feeds on the willow, and is more plentiful in the northern than the southern counties of England.

We next take the GROTIAN TORTRIX (*Dichelia grotiana*), the only British member of its genus. It is rather a pretty little insect, the upper pair of wings being ochreous yellow, partially banded with dark brown, and the lower pair, which are rather small in proportion to the insect, being grey-brown, edged with pale ochre. This is rather a southern than a northern insect.

There are perhaps few genera of insects in which the species exhibit more variety than in

the case with the genus *Peronea*. They may, however, be mostly referred to their proper genus by means of their long palpi, their elongated upper wings, and the tufts of raised scales which appear in the upper pairs. An example of this genus, *Peronea variegana*, may be seen on Plate XI. fig. 5, and another species, *Peronea hastiana*, at fig. 10.

Another species, known to entomologists as the BUTTON TORTRIX (*Peronea cristana*), is so called on account of the button-like prominences on the wings. In colour this is perhaps the most variable of all the genus, more than thirty distinct varieties having been recognized, very many of which have been marked in different catalogues as species. Variable as this Moth is, it may generally be distinguished by the tuft of white scales in the middle of the upper wings, and the long streak of lighter colour along their lower edge.

The Moth appears in autumn. A figure of this insect is given on Plate XI. fig. 3.

Next on our list comes the BERGMANNIAN TORTRIX (*Dictyopteryx*, or *Cræsia*, *Bergmanniana*)



Bergmannian Tortrix

This is a very pretty little Moth, the colour of the upper wings being ochreous yellow, with a decided gloss, and upon the hinder margin there is a brown belt, with a number of tiny white spots running through its centre. The hindwings are pale brown. This is rather a destruc-

tive insect in gardens, the caterpillars feeding upon the rose, and affixing themselves to the leaves by means of silken threads. The Moth is a very common one, as is its congener, the HOLMIAN TORTRIX (*Dictyopteryx Holmiana*), which much resembles the preceding species, but has on the edge of the upper wings a white triangular patch surrounded with a blackish grey belt.

WE now come to another family of Tortrices, the Penthinidæ, and take as our example a member of the typical genus. This is the pretty though soberly-coloured Moth shown on Plate XI. fig. 8 (*Penthina cynosbana*). All the Moths of this genus are exceedingly variable. The individual specimen now before us has the white patch at the end of the wings much larger than is the case with the specimen from which the figure was drawn, and the C-shaped mark which is so conspicuous in the figure is very small and ill-defined in my specimen. The dark portion of the wing is brown dappled with black, and the under wings are simply pale brown.

FOR examples of the family Spilonotidæ, we take two examples, both belonging to the typical



Cream Short-cloak.

family, the first of which is the CREAM SHORT-CLOAK (*Spilonota ocellana*), a pretty though not brilliantly coloured Moth. It is extremely vari-

able, the markings, though consisting simply of different shades of brown, being disposed in a wonderful variety of forms. In two specimens now before me, they are so different that it is scarcely possible to believe that both insects belong to the same species.

Another species, the BROWN CLOAK (*Spilonota roborana*), is shown on Plate XI. fig. 13.

The colours of this species are almost exactly the same as those of the preceding insect, and are also variable, except that a large patch of dark brown is to be found at the bases of the upper wings. The larva of this species is very troublesome in gardens, and does great damage to the roses, eating the buds and young leaves. The Moth appears in summer.

ON the same Plate, fig. 12, is shown an example of another family, the Sericoridæ. This is the NETTLE TORTRIX (*Sericoris urticana*), also a very variable insect, the colours being brown and whitish grey and distributed in a variety of forms. In the specimen now before me, the cross bands of the wings are comparatively indistinct.

ON Plate XI. fig. 11, is drawn an example of the Grapholithidæ (*Ephippiphora fæneana*). In this pretty Moth the white marks seen on the wings are of a pearly lustre, while the rest of the wing is shining brown, the lower wings being nearly as dark as the upper pair.

Another example of the same family is the WÆBERIAN TORTRIX (*Semasia Wæberana*).

This very pretty little Moth requires a mag-

nifying-glass to bring out all its beauties. Viewed with the unassisted eye, it is little more than a ruddy brown Moth ; but when the lens is brought to bear upon it, the wings are seen to be covered with a vast number of glittering markings, looking as if they had been delicately pencilled in gold and then burnished.

Unfortunately, this lovely little Moth is as destructive as it is beautiful, and in some cases becomes one of the veriest pests to the gardener and fruit-grower. The larva, which is small and greenish with a yellow head, affects the plum, the



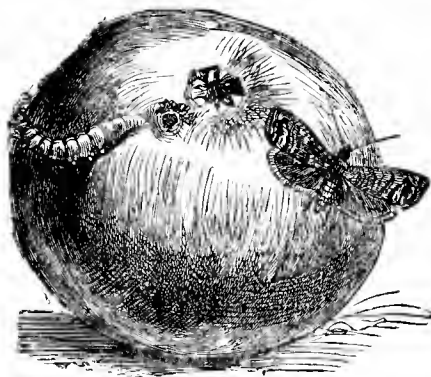
Wæberian Tortrix.

peach, the apricot, and indeed almost every stone-fruit. Unlike most larvæ, it does not eat the leaves or fruit, but feeds on the inner bark, and burrows beneath the outer bark so as to reach its food. It may, however, be detected by the little round holes which it leaves in the bark, and the yellowish powder which falls from them, and may be destroyed by brushing a little oil into the holes. When it is full-fed, it passes into the chrysalis state within a cocoon, and the Moth appears first in May, a second brood appearing about the middle of autumn.

Another very destructive insect comes next on our list. This is the CODLIN MOTH (*Carpocapsa pomonana*), a figure of which is here given.

This is also a singularly pretty Moth when examined closely. The upper wings are greyish brown banded with darker brown, and having towards each end a patch of warm chestnut, on which is drawn a rather elongated mark like the letter O traced in burnished gold.

Beautiful as it is, it ought to be destroyed whenever seen ; but-as it has a habit of concealing itself in the crevices of the bark of the tree on which it feeds, to discover it is not an easy



Codlin Moth.

matter. This Moth is the cause of great destruction among apples, especially the codlin kind. All apple-growers, and many apple-eaters, must be aware of the unpleasant state of many apples when they become "worm-eaten." In some cases the whole interior of the apple is filled with a brown dust and pierced full of holes ; and in others, the cause of all this damage is found in the shape of a white grub-looking caterpillar which is the larva of the Codlin Moth.



When the caterpillar is full-fed, the apple falls from the tree, and the larva eats its way through the rind and issues for the first time into the open air. It instinctively makes for the trunk of a tree—generally that on which the apple grew—ascends it, and conceals itself within a crevice of the bark. There it spins a silken cocoon of a whitish colour, and in the following summer issues in the shape of the beautiful Moth which has just been described. The preceding illustration represents the moth, the larva, and the apple.

On Plate XI. fig. 16, is drawn another Moth of this family, known by the scientific name of *Stigmonota regiana*.

This very conspicuous little Moth has the upper wings black, with the exception of a large yellow patch in the middle of the lower edge, and several yellowish-white dots placed obliquely in the centre. The lower pair of wings are blackish brown, and the feathery fringe is yellow.

As an example of another family, the *Cochylidæ*, we will take the Moth which is shown on Plate XI. fig. 14, and is known by the name of *Eupæceli hybridellana*.

THE last of the Tortrices which will be mentioned in this work is that which is shown in Plate XI. fig. 15. Its name is *Xanthosetia hamana*.

This pretty Moth is rather variable, though the colours are tolerably constant. In the specimens before me the upper wings are cowslip yellow, marked with ruddy brown bands not reaching quite across the wing, and some spots of the

same hue, very much smaller than those of the figure. The lower wings are pale brown, and the fringe is pearly white.

## TINEÆ.

Though individually of small dimensions, the group of the Tineæ is collectively a very large one, and embraces within its limits some of the most destructive British insects, among which may be mentioned the Honey-comb Moth, which destroys hives in spite of the bees' venomous stings; the Clothes Moth, which makes havoc among wool, fur, and feathers; and the Grain Moth (the "rust" of the Scriptural Moth and Rust).



*Incurvaria capitella.*

Our first example of the Tineæ belongs to the typical family, the Tineidæ. This is the TRIPLE SPOT BLACK MOTH (*Incurvaria capitella*), a figure of which is here given.

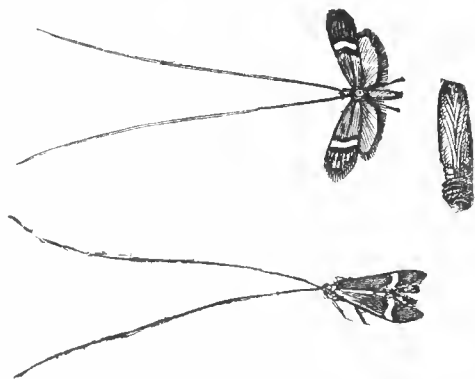
This is a most lovely little Moth, the upper wings being deep purple, with a metallic gloss. The three spots which are seen on each wing are of a beautiful golden yellow, making the insect a very conspicuous one.

The larva of this Moth is one of the burrowers, making its way into the tender shoots of the currant, and completely tunnelling out all their interior. It is a tolerably common Moth, and may be captured in the day-time, fluttering about the

currant-bushes or settling upon them. The perfect insect appears about June.

NEXT we come to some singularly beautiful insects, remarkable for the enormous length of their antennæ.

The first of them is the LONG-HORN (*Adela De Geerella*), one figure of which is given in the illustration with its wings extended, and another with them closed. The length of the antennæ may be



Long-horn Moth.

understood from the fact that a Moth scarcely a quarter of an inch long has the antennæ an inch and a quarter long, exactly five times the length of the body. These antennæ are as fine as spider-webs, and as the insect sits on the oak-leaf the antennæ wave about with every breath of air, looking like threads of iridescent spun glass. This appearance is due to the colour and disposition of the minute scales which cover the antennæ, and

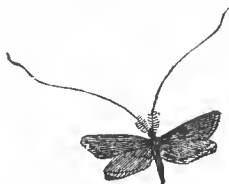
which are far too small even to be seen at all except with the aid of a powerful microscope.

Scales of a similar character cover the wings, which to the unassisted eye are simply brown, with a few gold-coloured streaks, but which, when seen by the aid of a microscope and well-arranged light, form as gorgeous a spectacle as the mind of man can well conceive.

The larva of this Moth feeds in rather a curious manner, making a sort of case or cocoon of the leaves on which it feeds, and never quitting its home until it has passed through its preliminary stages. The larva of the Adela is shown in its case on cut I, fig. 4, p. 117.

Near the figure of the Moth is one of its chrysalis. The attention of the reader is particularly called to the spiral thickening of the tail. This is caused by the antennæ, which are led down from the head of the chrysalis to the tail, and are then wound round and round in a regular spiral.

Another species is the GREEN ADELA (*Adela viridella*).



Green Adela Moth.

As its name imports, its colour is green, the upper wings being of a bright bronze green,

shining in certain lights like polished metal. The under wings are maroon brown, with metallic bronze fringe.

The Moth is also an oak lover, and in the copses of West Kent, wherein oak underwood is plentiful, any number of these lovely Moths may be taken at the proper season of the year.

THE family of the Yponomeutidæ is represented in this work by the typical insect, the LITTLE ERMINE MOTH (*Yponomeuta padella*).

This very pretty and very destructive insect derives its popular name from the colour of the upper wings, which are glossy satin white, sprinkled with black dots. The lower wings are pale greyish brown.

In the larval form this insect is terribly destructive, sometimes demolishing the foliage or whole hedges and forest trees, and enveloping them in a mass of silken threads and webs of such size and toughness that even the very sparrows can scarcely make their way through them when they alight on the tree for the purpose of eating the caterpillars.

Fortunately for the gardener and fruit-grower, the white webs of these caterpillars are very conspicuous, and the larvæ may be destroyed by thousands. One of these webs is shown in cut L, fig. 2, page 23, as it appears when all the inhabitants are within. Some of these webs are six or seven inches in diameter, and contain a vast number of caterpillars. The head of the perfect insect is shown in cut I, fig. 3, page 117.

THE accompanying figure represents an example

of the family Plutellidæ, namely, the GREY STREAK (*Plutella porrectella*).

The upper wings of this Moth are greyish white, sometimes with a creamy tinge, and they are patched and streaked with dark brown. The lower wings are pale brown. This insect is sometimes called the ROCKET MOTH, because the larva chiefly feeds upon the rocket plant, drawing



*Plutella porrectella.*

the leaves together by silken threads, and concealing itself in the middle of them.

This is one of the double-brooded Moths, one set appearing in the spring and the other in the autumn.

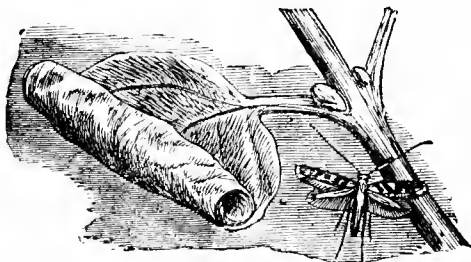
PASSING by a considerable number of families, we come to a very plentiful and very mischievous little insect, the CONFLUENT-BARRED MOTH (*Gracillaria syringella*), which is here shown together with its habitation.

The colour of this Moth is rather pretty, the upper wings being ochreous yellow, mottled with dark brown, and having at the tips an eye-like mark with a black centre. The lower wings are plain light brown.

When first hatched, the caterpillar of this Moth burrows into the leaves of the plant on which it feeds, which is generally the lilac, and there remains until it is able to prepare an habitation for itself. It then makes its way out of the burrow,

and proceeds to another leaf, which it rolls up, as seen in the illustration, tying the leaf down with silken threads.

The mode in which it accomplishes a task which is apparently far beyond the physical powers of the creature is very interesting. The little caterpillar begins by spinning threads and fixing one end to the top of the leaf, and the other to the centre of it. These threads are arranged in a row, and when they are all fixed



The Confluent-barred Moth.

the caterpillar goes over them again, pulling them alternately with its feet so as to shorten them, and fixing the shortened portion down by new thread-matter from its spinneret. Slowly, almost imperceptibly, but surely, the leaf is brought to the required shape by the accumulated action of these threads; and when the cylinder is completed the caterpillar creeps into it, and there remains secure.

A much magnified example of another species of the same genus is given in Plate XII. fig. 3. Its name is the GOLDEN SPOT (*Gracillaria auroguttella*).

The very conspicuous spots on the upper wings are golden yellow, and the ground hue of the wings is dark shining grey. The hind-wings are brownish grey, with a very long pale fringe. There is another species which closely resembles this insect. It is called the FOUR SPOT (*Gracillaria quadrisignella*), and has four spots on a dark grey ground. But in the latter species the spots are pale sulphur, and they are arranged almost perpendicularly on the margin.

The larva of this Moth is whitish green, and feeds on one or two species of St. John's-wort (*Hypericum*).

AN example of another family, the Coleophoridae, is found in the small but pretty insect which is given in Plate XII. fig. 1, much magnified. This is the LITTLE WAGGONER (*Coleophora currucipennella*).

The upper wings of this species are white, and the veins are yellow, becoming brownish towards the tips of the wings. The lower wings are grey brown.

The larva of this insect feeds upon the leaves of various trees, such as oak, hornbeam, sallow, &c., and makes for itself a curious little blackish case from the leaves. The form of the case is something like that of a pistol stuck muzzle downwards in the leaf, and in this case the caterpillar resides throughout its life.

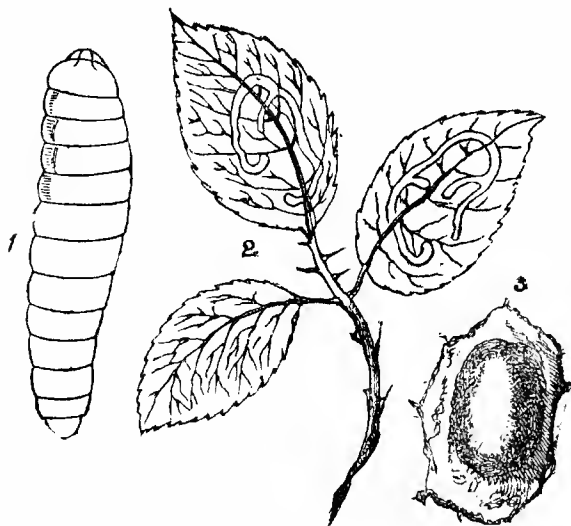
There are more than fifty acknowledged species of this genus.

THE tiny Nepticulidae are represented in this work by the GOLDEN PIGMY (*Nepticula aurella*)



a Moth which is shown much magnified in Plate XII fig. 2.

This family contains the smallest and yet the most brilliant examples of British lepidoptera, most of them being so tiny that the aid of a magnifying-glass is required to set them when captured, and to make out the real form and hues



J.

of their beautiful colouring. In consequence of their minute dimensions, they are popularly known as Pigmy Moths.

The larvæ of all these insects are more like maggots than caterpillars, and burrow into the interior of leaves, making their way between the two layers of the leaf, eating the soft intermediate

substance, or "parenchyma," and producing the devious tracks which are so common on many leaves, especially those of the bramble.

The upper wings of the Golden Pigmy are of a rich golden brown, becoming deep purple beyond the middle, across which runs a single band as of burnished gold. Other species possess a golden band very similar in appearance, but the Golden Pigmy can always be distinguished by the purple hue which has been described.

The larva of this pretty little Moth is one of the bramble miners ; and can easily be procured and reared into the perfect state.

The illustration in the preceding page represents the earlier stages of this Moth. Fig. 1 is a much magnified representation of the maggot-like larva, which has no projecting feet, because it needs none to enable it to force its way through the leaf. Fig. 2 shows the bramble leaves, with the mined tracks in them, and fig. 3 is a magnified representation of the tiny cocoon, found at the end of the burrow.

#### PTEROPHORI.

We have now but two Moths to describe, both of them belonging to the strange family of Pterophoridae, or Plume Moths. The wings of these insects are most curiously formed, and bear the same relation to those of ordinary Moths, as do the feather fans to those made of paper or other fabric. In the Plume Moths, the wings are not formed of a membrane stretched upon rays, but each ray, or nervure, forms the stem of a separate plume. In the lower wings, these nervures are

separated nearly to the base, but in the upper wings are only partially separate.

A very common species of this group is shown on Plate XII. figs. 4 and 5, both figures being of the natural size. The former of these is the WHITE PLUME (*Pterophorus pentadactylus*), sometimes called the PHANTOM, or the SKELETON. This very pretty Moth is snowy white, and is very plentiful, coming out in the evenings and fluttering softly along as if it were a snow-flake borne by the wind.

The second species is the STONE PLUME (*Pterophorus lithodactylus*), in which the wings are stone-grey instead of white.

THE accompanying illustration is a figure of the beautiful TWENTY PLUME MOTH (*Alucita polydactyla*), enlarged to twice its natural size.



Plume Moth.

This is the only British example of its genus, and cannot be mistaken for any other Moth, the numerous Plumes, amounting altogether to twenty-four, being found in no other insect. This Moth has a strange predilection for the habitations of man, and may be seen fluttering up and down the inside of windows, especially those of out-houses.

## CHAPTER VI.

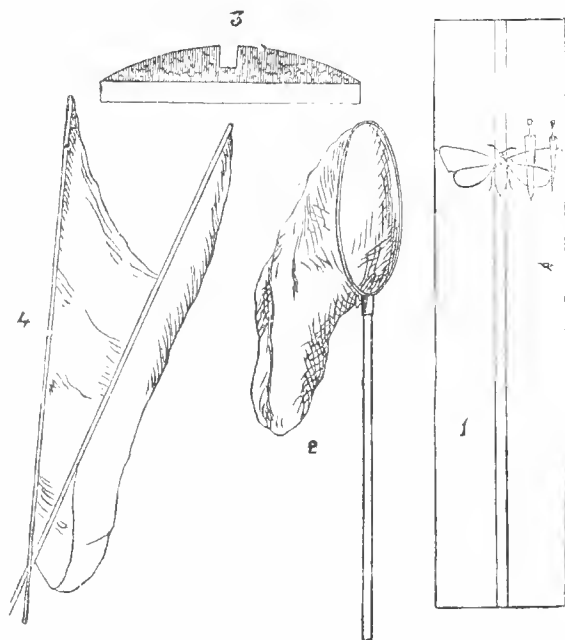
WE conclude with a few hints upon capturing and preserving Moths.

The ordinary mode of taking Moths is by means of the net, two forms of which are shown in the illustration in the next page.

Fig. 4 is the clap-net. This is made of two rods, which support between them an oblong piece of green gauze, and by some entomologists is very highly valued. I, however, never could use it with any confidence, both hands being required, and the shape of the net rendering the insect-hunter to be liable to tumble over the various obstacles which are sure to lie in his way.

The net which I prefer is the common ring-net, shown at fig. 2. This is simply an iron hoop, sustaining a green gauze bag. This net is held in one hand, and by a slight stroke of the arm the Moth may be captured, while a turn of the wrist doubles the net over the hoop, and prevents the Moth from escaping. The "scissors" net is also used by entomologists. This is so formed that Moths sitting on leaves can be captured between the flat blades of the scissors, leaf and Moth being enclosed together.

Moths being for the most part nocturnal, night is the best time for catching them, and the most effective mode of doing so is by "sugaring." Boil together the very coarsest moist sugar and beer, mix some new rum in it, and keep it tightly



K.

stopped. When about to go off after Moths, immerse a dozen or so pieces of rag in the sugar, and put them, still moist, into a little pot. Take a bull's-eye lantern, the net, and plenty of pins and boxes, and start off after dark for some place where

there are trees. Pin the rags on the trunks of the trees, and after half an hour or so light the lantern, tie it on the waist, so as to leave both hands at liberty, and go round the trees. Upon and about all the sugar-rags will be a very crowd of Moths, some of them with their eyes gleaming like living opals, some flying, and some sitting on the tree quite stupefied with the rum.

Figs. 1 and 3 show the "setting-board" as seen from above and in section.

Any one can make a setting-board. It is only needful to procure some flat cork from the cork-cutter's, cut it into strips, and then glue them on a board, leaving a sufficient space between them for the body of the Moth. Many entomologists bevel off the cork, as shown in fig. 3, but personally I prefer the cork to be flat.

In order to "set" the Moths properly, cut a number of triangular slips of card about an inch in length, and a quarter of an inch across at the base. Also, push the eye portion of a fine needle into a slight wooden handle—a common lucifer match will do very well.

Have the cards ready and a store of pins, some of the ordinary kind, and some which are very fine and made expressly for the purpose. These pins can be obtained at any of the dealers in objects of natural history, and it is as well to have also a pair of small long-nosed pliers.

Pass the fine pin through the centre of the Moth's thorax, and then fix it in the setting-board, the body of the Moth lying in the groove between the corks. With the inverted needle draw the wings into their proper attitude, as seen in the illustration, and then fix them by

laying on them one of the slips of card, through the base of which a pin is then run into the cork. The antennæ must also be arranged and fixed with pins, and the insect left until it is quite dry.

As to preservation against the dreadful mite, whose ravages will in a season destroy the labour of years, I have found that the comparatively slow process of immersing the insect in poison is the most effectual preservation. Make a solution of corrosive sublimate in spirits of wine, and make it so strong that when a black feather is dipped in it and then dried a white frosty dust appears on the surface. Then continue to weaken it by the addition of spirit until the white efflorescence has disappeared, and the solution will be exactly the right strength.

Dip the Moth boldly in this solution, and take off the superfluous moisture at the ends of the wings by blotting-paper; then shake it gently in the sun or before the fire, or place it under the sash of a window raised about one inch, so that a strong draught shall pass through it. If these directions be carefully attended to, not the least particle of down will be disturbed, and feathery Moths will appear just as fresh as when they were first taken.

Large-bodied Moths, such for example as the Death's Head, the Puss, the Lappet, and others, must be stuffed in order to prevent "grease,"—a horrid oleaginous substance which exudes from the bodies, and spreads even to the tips of the wings, making the insects look as if they had been dipped in oil. The best way is to remove the abdomen at its junction with the thorax, and

carefully to remove the contents. Fill up the space lightly with cotton-wool, pour into the wool two or three drops of the poison, and then fix the abdomen in its place with diamond cement. By following this plan the entomologist will not only avoid grease, but will preserve the bodies of his Moths from shrivelling and wrinkling, than which nothing looks worse.

Should the reader wish to take up the rearing of Moths, he can do so in two modes ; namely, by preserving the chrysalis and rearing the larvæ, in many cases doing so from the egg, as with silkworms.

The best mode of obtaining the chrysalis is to hunt for it in the haunts of the insect, and in all cases the bark of trees and the earth near their roots are tolerably sure localities. Solitary trees, especially the oak, are the best, and in digging up the earth near the foot vast numbers of pupæ may be found, the number increasing in precise proportion to the amount of practice. There are few things more deceptive than such localities, for a novice may hunt for an hour and never find a chrysalis, while a practised digger will take the very same soil, and carry off a pocketful of treasure.

For the following excellent account of breeding the insect from the egg, I am indebted to my friend Albert H. Jones, Esq., of Eltham.

#### GLASS CYLINDERS FOR REARING LEPIDOPTERA.

For two or three years past I have been very successful in rearing a great many Lepidoptera from the egg (more especially the Geometræ), by



means of glass cylinders. The system not only shows a good result as regards the number of specimens bred, but also affords abundant opportunity for observing the various habits of the larvæ. The apparatus is made as follows:—

First procure a saucer (the largest that can be obtained), through the centre of which a hole must be made. This may easily be done by placing the saucer, inverted, on some soft sub



Fig. 1.

A (shaded lines).—The saucer.

B.—Rim of saucer, over which calico is stretched and pasted at F.

C.—Calico stretched from edge of saucer (B) to eyelet (D).

D.—Eyelet fastening down the calico.

E.—Hole in saucer.

stance (a pillow for instance), and striking it sharply with the point of some instrument with sufficient force to make a small hole, which must then be enlarged so as to admit of a brass eyelet.<sup>1</sup> Then stretch a piece of calico over the saucer and paste it to the under-side, care being taken to leave it sufficiently slack, so that, when dry, the brass eyelet can be inserted, and fastened with the ring at the reverse side of the saucer. (See section of the saucer, fig. 1.)

The portion of the eyelet which passes through the hole must be cut in such a way that the edges will bend over and hold the ring. The

<sup>1</sup> Brass eyelets with rings are obtained at Barton and Sons, 48, Goodge Street, Tottenham Court Road.

next thing to obtain is a glass cylinder,<sup>1</sup> open at both ends, over one end of which stretch fine muslin and paste it to the edge of the glass. The diameter of the cylinder should be about one inch less than that of the saucer. The gallipot to hold the water, in which the stems of the food-

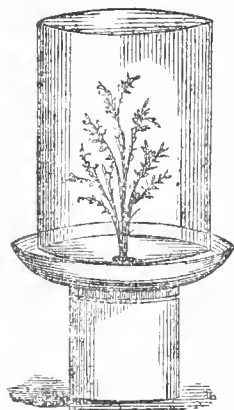


Fig. 2.

plant are to be placed, should fit on the outside of the rim of the saucer. The apparatus is now complete and appears as in fig. 2. When the food requires changing, invert the cylinder with saucer (fig. 3); cut off the ends of the plant which have been in the water, and replace the saucer on the gallipot, leaving the food and larvæ in the cylinder; then put in the fresh food through the hole in the saucer, and replace the cylinder without removing the larvæ, which will as a

<sup>1</sup> Glass cylinders are merely glass shades with the tops cut off, and doubtless could be obtained at most shops where such are sold.

matter of course crawl from the old to the fresh food. The withered plant can be removed after a time without disturbing the larvæ.

When the eggs are hatching, place instead of the cylinder, a tumbler over the food-plant, and keep it over the young larvæ until they are large enough to be removed. This prevents their wandering too far away from their food, which is an important point when the larvæ are very small.

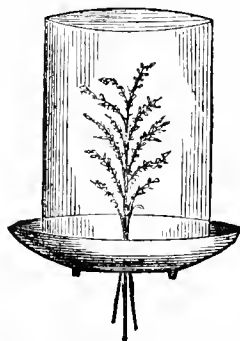


Fig. 3.

Many larvæ, and especially the *Geometræ*, require but little depth of earth in which to turn; therefore, when they are about to assume their proper state, place a little mould on the calico, which will be found to be all that is necessary. However, for those that require a greater depth of earth it is advisable that the larvæ, when nearly full fed, be removed into other quarters.

I then found the following plan a good one.

Procure a fern-pot,<sup>1</sup> to the rim of which have fitted a cylinder of perforated zinc, so that it can be removed on and off; across the top of the cylinder stretch muslin, and fasten it round the top by means of string. In the centre of the fern-pot place a small gallipot having a lid of perforated zinc, in which make several large holes for the admission of the food-plant. The space round the gallipot fill up with mould

<sup>1</sup> Fern-pots are to be got at potteries. Pascal of Chiselhurst supplies them of all sizes.



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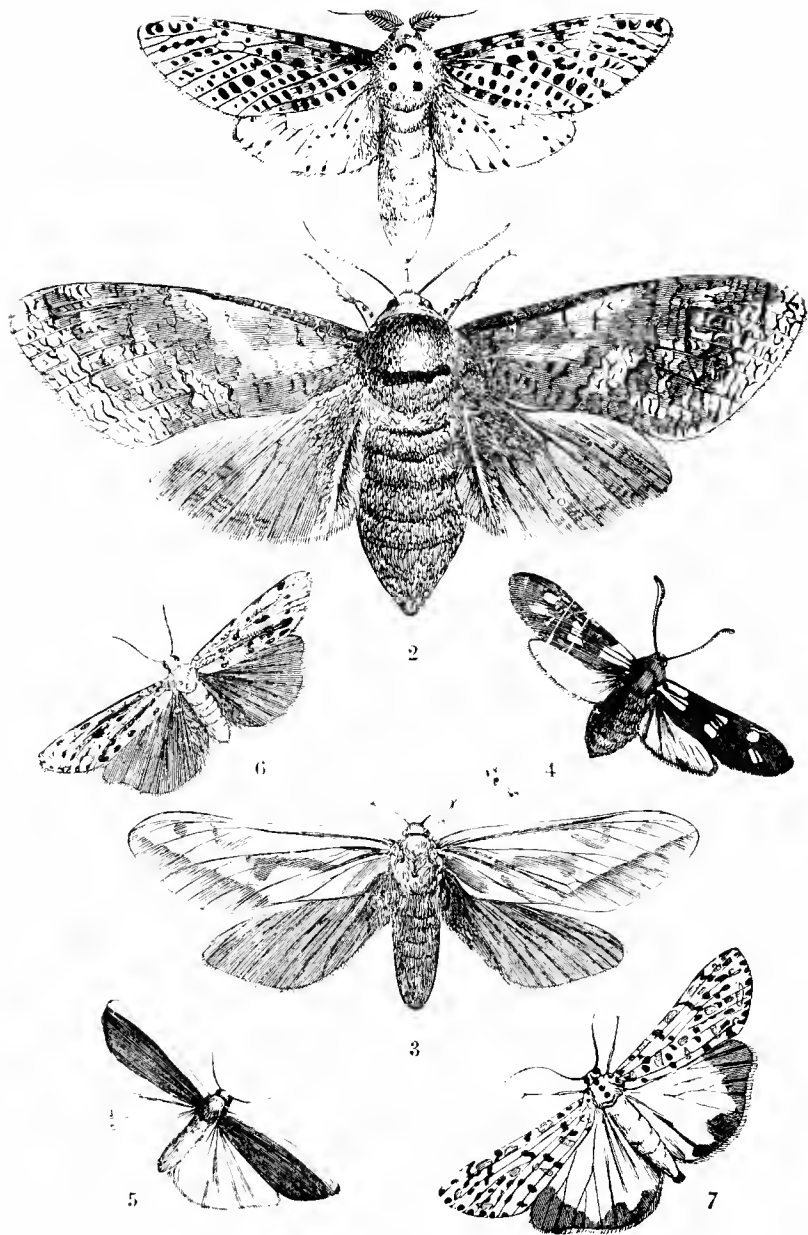
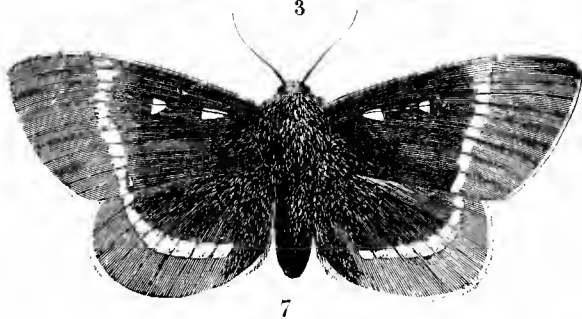
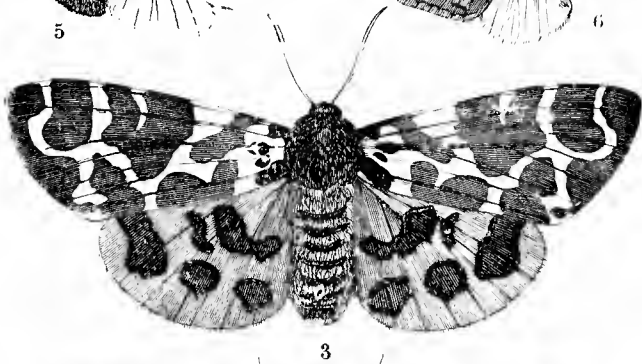
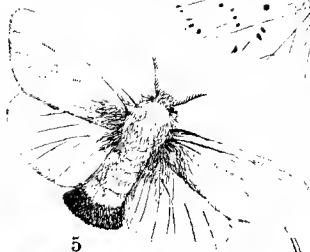
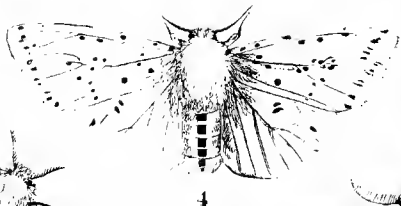
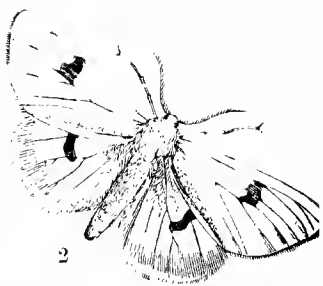
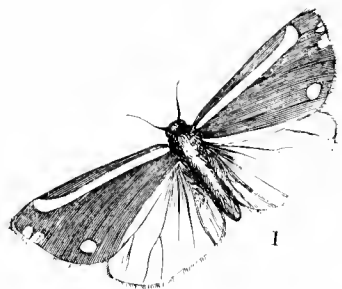


PLATE II.









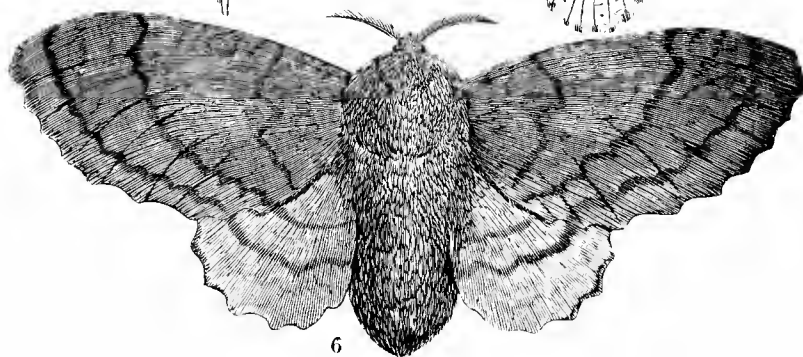
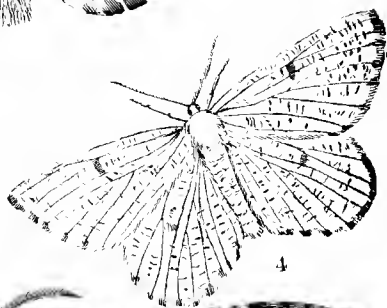
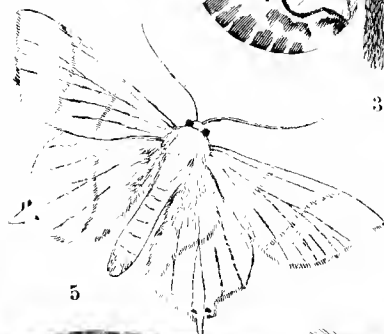
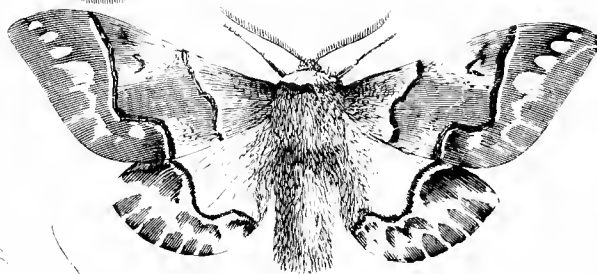
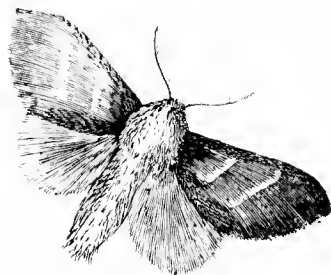
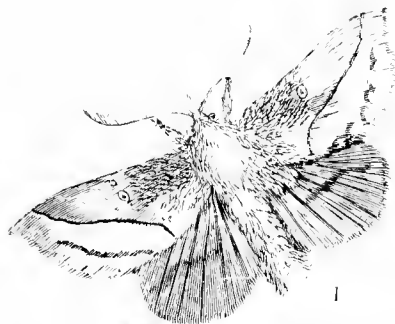
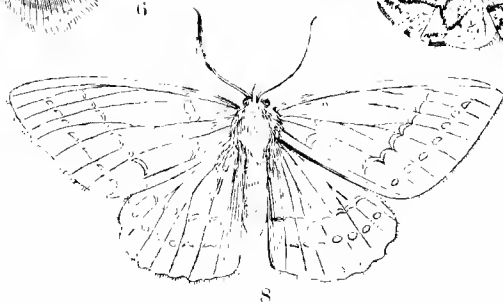
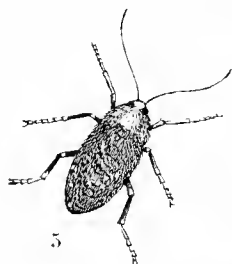
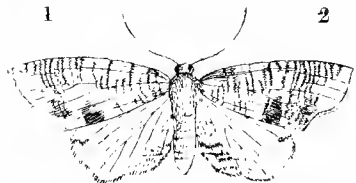
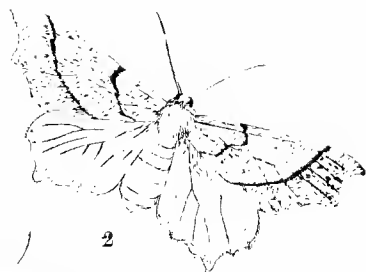
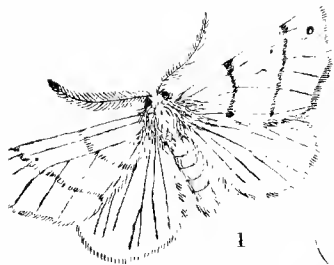
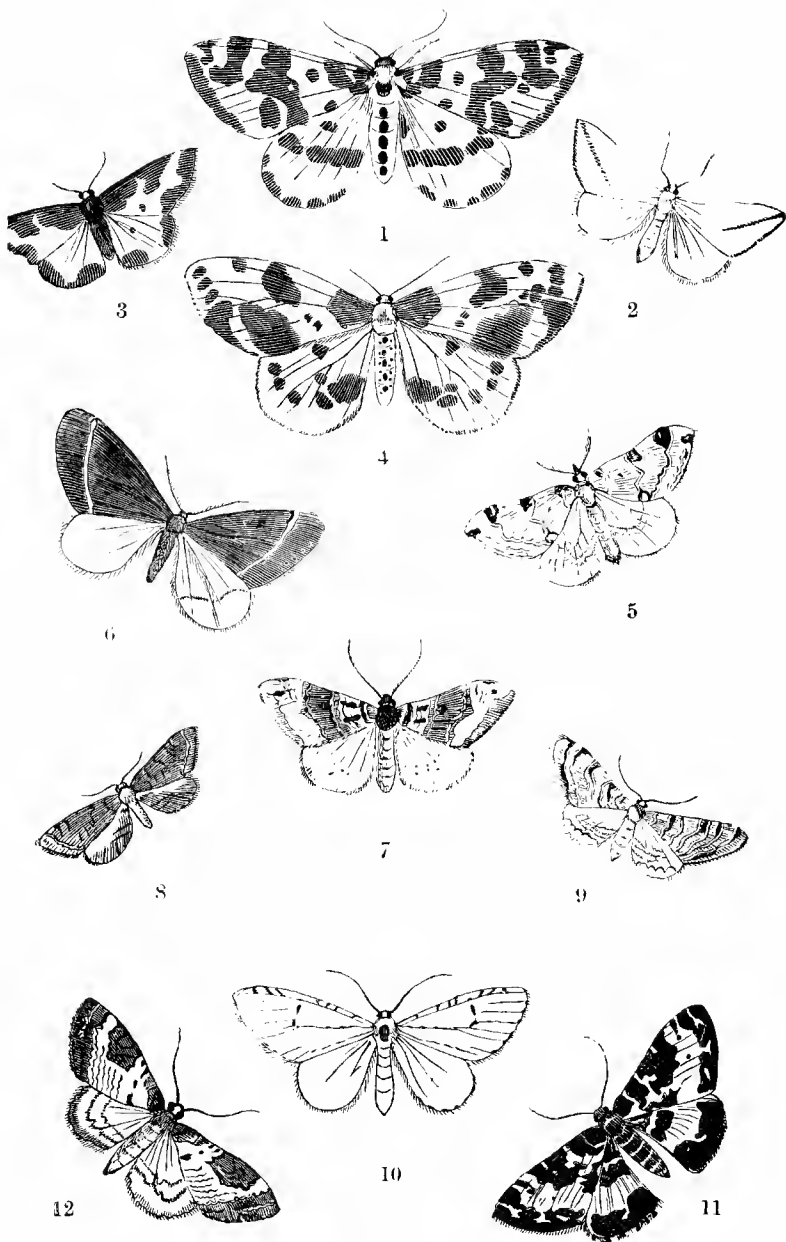


PLATE IV













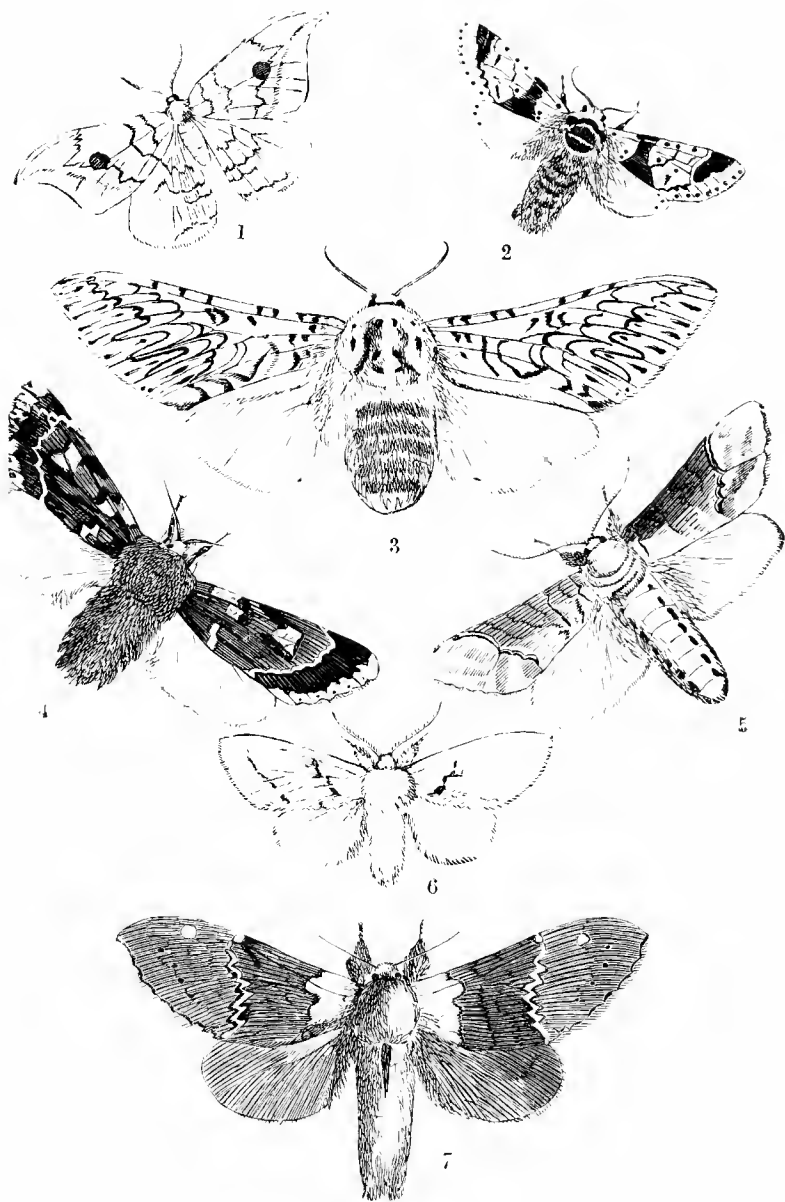


PLATE VII



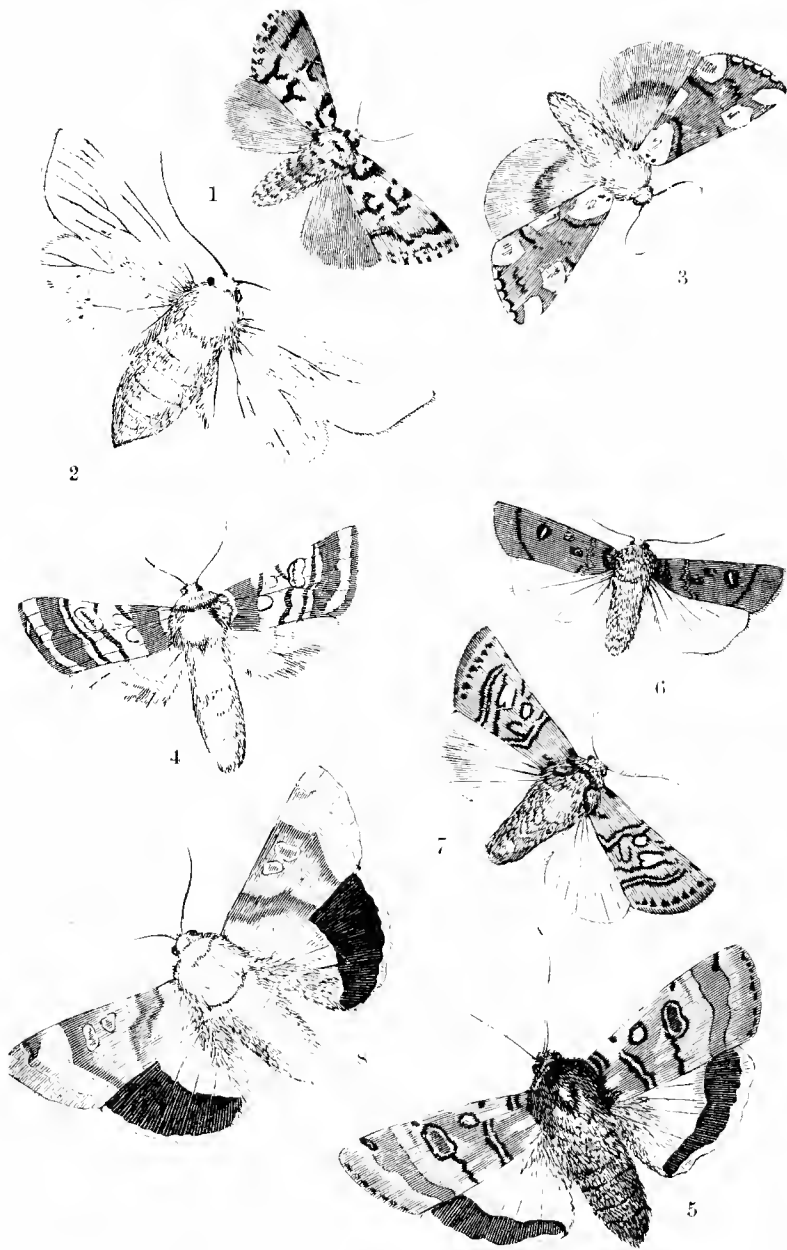


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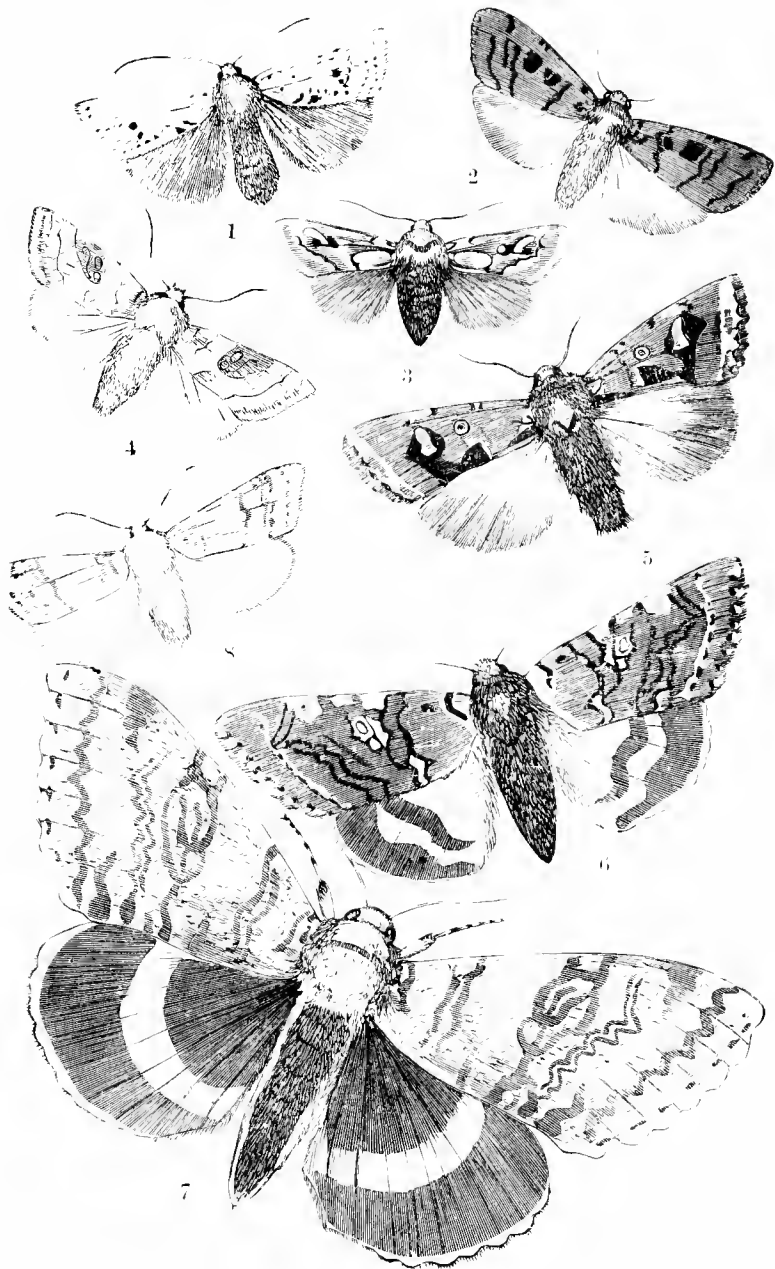


PLATE IX.



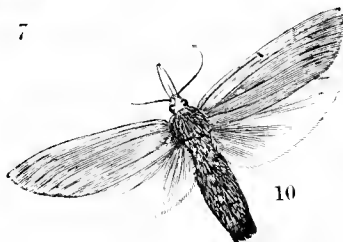
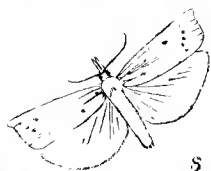
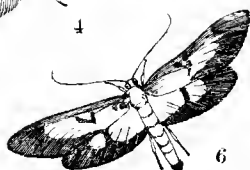
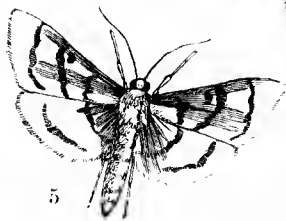
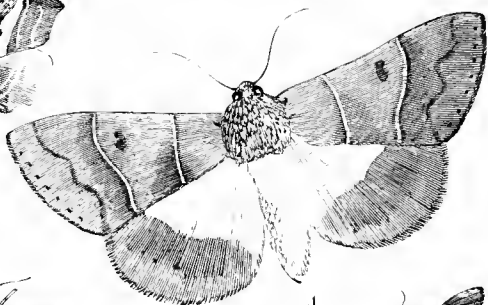
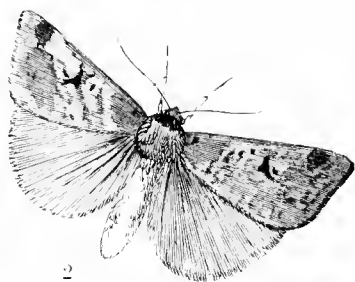
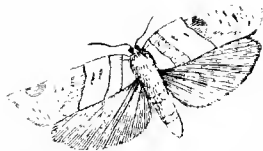


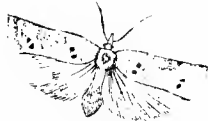
PLATE X.







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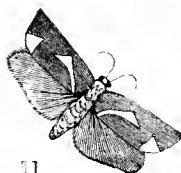
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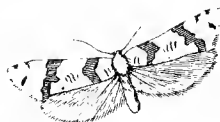
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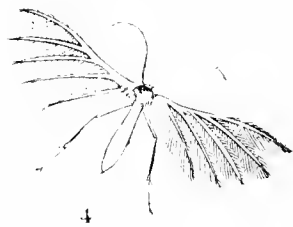
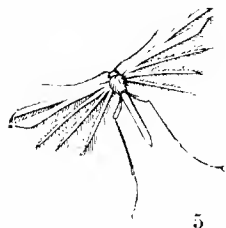
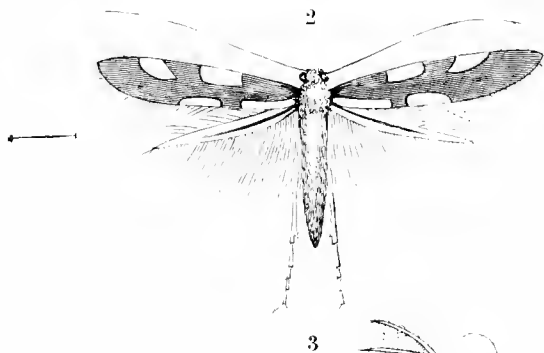
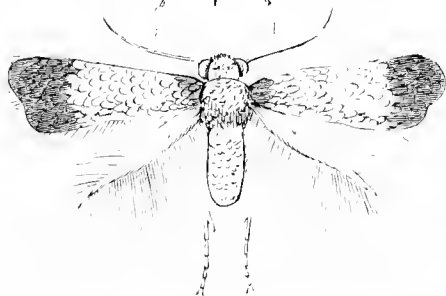
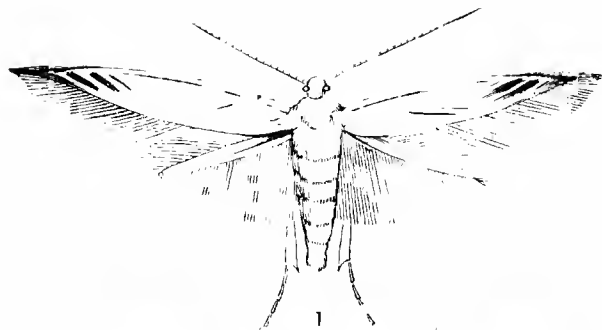


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